FACTORY

MANAGEMENT AND MAINTENANCE

A McGRAW-HILL PUBLICATION

DECEMBER 1941

NELSON on WHAT'S AHEAD

Electric Motor Switches and Aircraft Firing Keys

....what have they in common?

BAKELITE Molding Phenolics, which have long been used in the manufacture of industrial motor switches, now provide the same performance advantages for aircraft firing keys:—

Superior electrical insulation
Mechanical strength
Resistance to heat, cold, and moisture
Dimensional stability

IN MILITARY AIRCRAFT, a single key mounted in the pilot's control stick actuates the simultaneous firing of a battery of machine guns. Because this firing key is frequently the determining factor between safety and disaster in combat, it must be made of materials that meet the severest specifications.

The key frame must possess superior dielectric properties, to safeguard permanently the integral metal parts against short circuits. It must be dimensionally stable, to prevent the key operating mechanism from jamming or loosening when exposed to extreme heat, cold, and moisture. It must be tough enough to withstand terrific plane vibrations and the constant impact of powerful, spring-operated electrical contacts.

In seeking such a material, the defense authorities found it already at hand . . . a BAKELITE Phenolic Molding Plastic. For many years, it had provided for electrical motor switches the identical performance characteristics now essential to aircraft firing keys. Furthermore, the same economical and rapid method of compression-molding the motor switch parts was readily adaptable to fabricating the firing key frames.

Perhaps you, too, may find an immediate solution to your design and production problems with one of the numerous materials obtainable from Bakelite Plastics Headquarters. These materials are described and illustrated in Booklet 12P, "New Paths to Profits." Write for a copy today.

BAKELITE CORPORATION
Unit of Union Carbide and Carbon Corporation

30 EAST 42ND STREET, NEW YORK

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PLASTICS HEADQUARTERS

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They're going to stop slapping our tank corps around

A typical example of Goodrich development in rubber

THEY used to say "You can tell a member of the tank corps by his broken nose." Lurching, crashing over ditches, stumps, rocks, the crew were hurled against the steel walls so that often in 15 miles of cross-country travel sprains, cuts, broken bones made the crew casualties — they might arrive at the scene of battle unfit to fight.

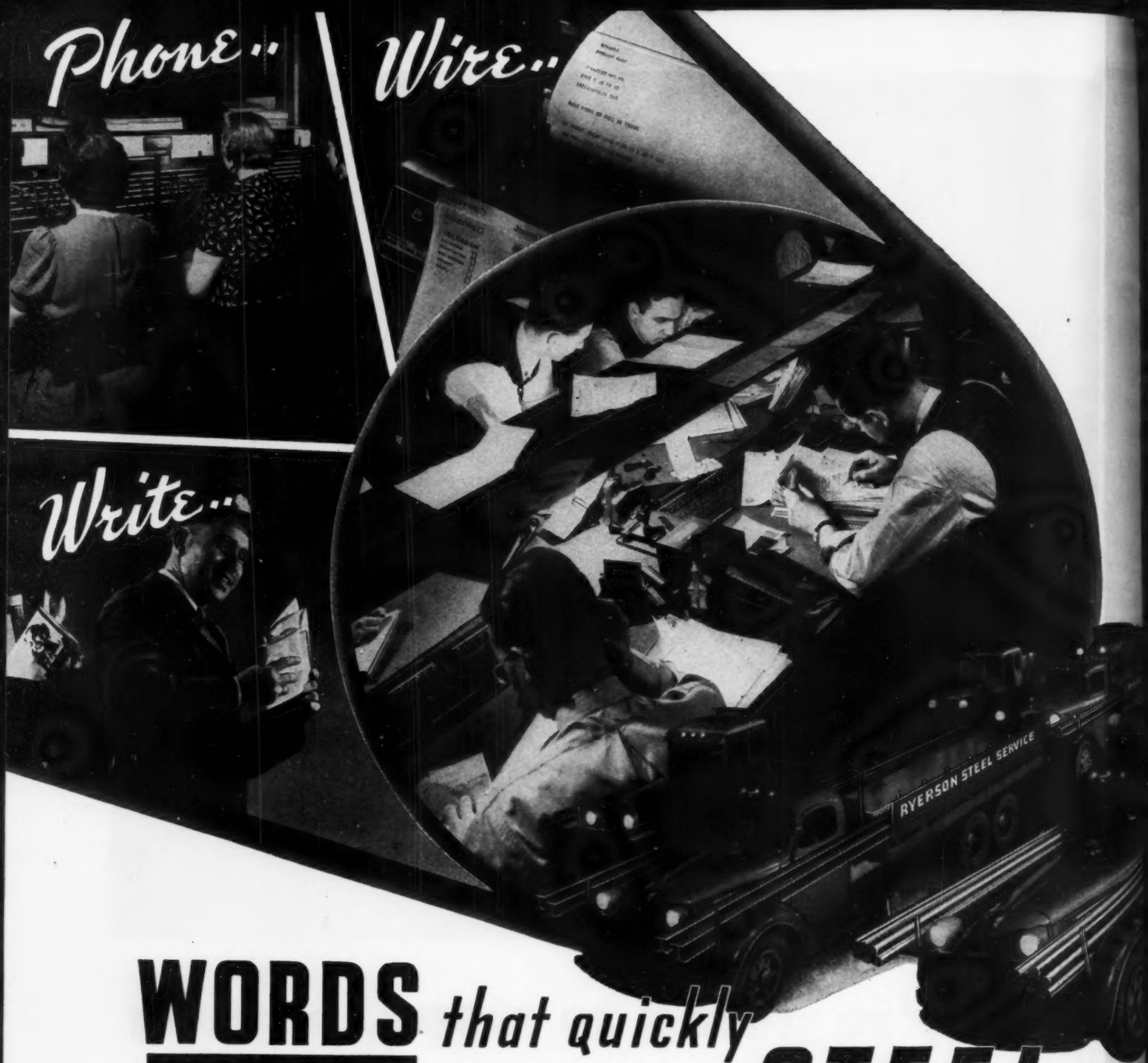
A Goodrich engineer wondered why they couldn't cover the sharp, dangerous parts of the interior with sponge rubber. He found the army already had this idea but they told him the light, soft sponge tore out too soon or was gouged away.

How protect the rubber so it could protect the men? Goodrich had developed a process of depositing a rubber skin on anything dipped in a bath of liquid rubber. It is called the "Anode" process. Sheets of sponge rubber were put in this bath, a soft skin of rubber as elastic and strong as an inner tube was deposited on the surface.

This coated sponge was then attached inside the tank's turrets, hatches, and all other dangerous points. It worked perfectly. The rubber "skin" protects the soft sponge from gouging and itself adds to the cushioning effect. And since this skin traps the air in the sponge rubber cells, the sponge becomes a pneumatic cushion with added protective softness.

Now big tanks will travel with greater safety and comfort for the crews by using this new "upholstery." *The B. F. Goodrich Company, Mechanical Goods Division, Akron, Ohio.*

B.F. Goodrich
First IN RUBBER



WORDS that quickly turn to STEEL

SUBMIT your steel requirements to this experienced, highly-specialized source. Telephone, wire, or write—however you communicate, you'll get action and effective co-operation.

If you phone, experienced operators connect you, *without waiting*, with a Ryerson steel man, a man who talks *your language*. Wires are received by teletype, direct from central telegraph offices. Mail is picked up hourly at the post office, a *faster service* than special delivery.

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Rapid handling of incoming orders is typical of Ryerson service in *every department*. It matches large and varied Ryerson stocks and Ryerson Certified Quality — an unequalled service to American Industry. Because many sizes are low or even missing, "Open orders" are advisable during the emergency. Stock list sent promptly on request.

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RYERSON CERTIFIED STEELS

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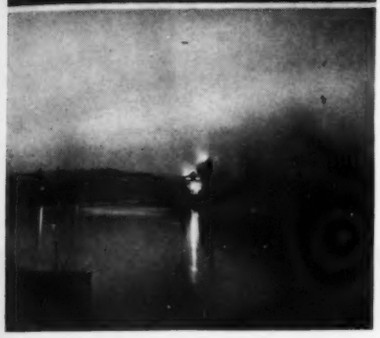
NELSON on WHAT'S AHEAD



Pittsburghers will recognize "Steel at Dawn" even if they are seldom up that early. Taken in full color, looking upstream from the 22nd Street Bridge, it shows Jones & Laughlin Steel Corporation's Bessemer Converter Department on the south bank of the Monongahela. There are two converters, each of 25 tons capacity. Stacks and roof at right belong to the adjoining Open Hearth Department. J & L hauls ladles of molten iron across its bridge in the background.

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FACTORY

MANAGEMENT AND MAINTENANCE

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TO GIVE NEW EFFICIENCY TO VENTILATION

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To convert a building full of machines into a close-knit productive enterprise, a lot of voices have to be heard from. Instructions... requests... information... orders ...assurances... consultations... up and down, back and forth, from general manager to janitor.

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The services of these men... like that of GRAYBAR Specialists in industrial lighting, power distribution and other electrical fields... are among the "extras" you get as a regular customer of GRAYBAR, backing up the individualized understanding of your electrical needs maintained by local GRAYBAR Representatives.

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GRAYBAR BUILDING
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10,400 Guns for Merchant Ships from Steel Conserved by Preformed Wire Rope

★ It pays to use preformed wire rope. Being preformed this "rope" lasts longer—cuts the number of machine shutdowns—steadies production. It is easier, faster, safer to handle. It saves both time and money.

★ But preformed wire rope does far more than that. By lasting longer, it conserves steel, and steel is a vital necessity to America today. Anything that helps conserve steel for America is of itself a vital necessity.

★ The steel conserved *this year* by the longer service of preformed wire rope would be enough to build more than 10,400 3-inch caliber guns for merchant ships.

★ Preformed wire rope is an essential to industry, a necessity for the Nation.

PREFORMED WIRE ROPE

Ask Your Own Wire Rope Manufacturer or Supplier

Osborn Brushing Specialists are Saving Hundreds of Man Hours on Vital Defense Operations

● Flashings removed from aluminum alloy castings up to 100% faster, with increased brush life of 40% to 200% tossed in for good measure.

Burr removal from stainless steel sheets speeded up 50%, with improved finish over the method previously used.

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These startling savings were discovered in modern, efficient plants by Osborn Brushing Specialists—and they're just a sample of scores of such findings that have released valuable man-power for more important work, cut costs, and made for improved products.

An Osborn Brushing Analysis of your plant will give you a complete, impartial picture of where and to what degree brushes can improve one or more cleaning, polishing or finishing operations. It will be conducted by brushing specialists who know their product and its field of application. Upon completing this Analysis, all recommendations are incorporated in a confidential, written report and submitted to you for final consideration.

This exclusive Osborn service costs you nothing except the willingness to examine the facts—and the odds are 100 to 1 you'll find plenty of worth while time and money-saving suggestions. *Write The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland, Ohio.*

Osborn Brushes

WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY

Who says you can't
COUNT YOUR CHICKENS
before they hatch?
Bombers who "drop the eggs" have got to be able to count them as hatched, before they hit the ground. And so with every weapon, piece of armament, and production tool that starts down the line toward completion. Every stroke of work, every shaft-revolution, every completed part that has to be counted, can be checked against a master control-pattern (based on facts-in-figures supplied by Veeder-Root counting devices.) Yes, today, you've got to be able to count your "war-birds" before they hatch. And you, on the front line of defense production, can count on us to help in every permissible way.
VEEDER-ROOT
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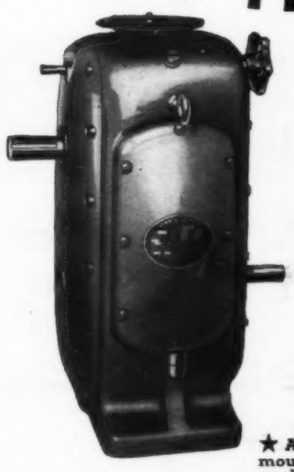
BOOST MACHINE OUTPUT!

WITH THIS AMAZINGLY ACCURATE SPEED CONTROL!



Today, when production is vital—when every machine must deliver its maximum capacity — you should, by all means, take advantage of the increased machine efficiency which the P.I.V. Gear provides. With this ingenious device, a twist of the wrist sets the machine, while running, at the "ideal" speed for any operation. Built on the tooth-to-tooth drive principle, this control is positive and accurate—and, it is so compact that it can be installed easily, even where space is limited. Seven sizes in five types are offered for your selection—write for Data Book No. 1874 *now!*

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★ Available in horizontal and vertical mountings . . . motorized and gear set models . . . automatic, vernier, manual, direct, or remote control.

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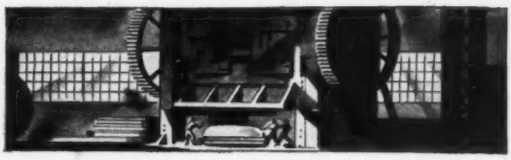
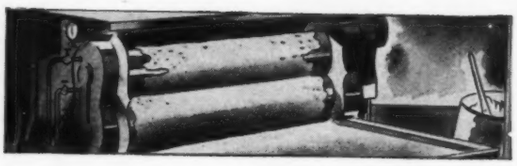
POSITIVE INFINITELY VARIABLE SPEED CONTROL

HE CALLED FOR HELP AND HE'S GETTING IT

FROM NOT 1 BUT 5





—How Taylor is helping not 1 but 5 essential industries help Uncle Sam

EVERY INDUSTRY in America has buckled down to the job of helping build up U. S. defense. Every American industry is an essential industry today. *Your* production is *essential* production. Uncle Sam needs your help. He can't be prepared without it.

In thousands of plants and factories—in all *essential* industries—Taylor Instruments are right on the job. Just to illustrate how Taylor is helping, consider five—*not 1 but 5*—industries.

Chemicals, metals, petroleum, power, and rubber are vital needs of this nation. The chemical industry has stepped up its wonder-working. Familiar chemicals are being produced faster. Better chemicals in larger quantities are being turned out. New chemicals are appearing. The chemical industry has always depended on Taylor precision.

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Power—unlimited, uninterrupted power—must run America's humming factories. Taylor Instruments help produce that power economically. Uncle Sam needs rubber—needs it for a million jobs. Taylor Instruments have helped make the increased production of finer rubber an almost 100% automatic operation.

For a good many years, Taylor and all American Industry have been partners in precise production. Taylor has learned a whole lot from this work together. What we've learned is yours to use. If any experience, any special skills of Taylor Instrument Companies will help solve your particular production or processing problems — or help you get better service from your present instruments—please call us. There are no strings to this offer. Taylor Instrument Companies, Rochester, N. Y. Also Toronto, Canada.

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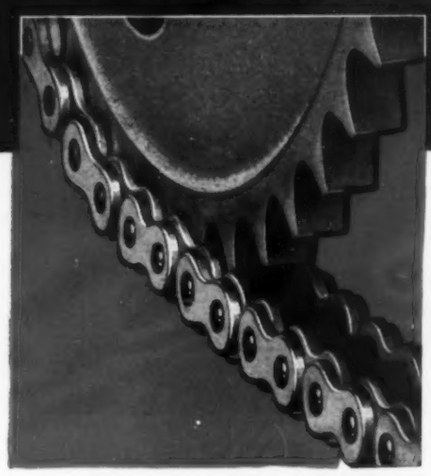
Taylor-MADE MEANS BETTER MADE IN AMERICA BY AMERICANS

Taylor

Indicating Recording Controlling

TEMPERATURE, PRESSURE, FLOW *and* LEVEL INSTRUMENTS



CUSHIONED ROLLER ASSURES LONGER WEAR!

When the sprocket teeth mesh with Silverlink roller chain, the unique curled roller acts as a shock-absorbing spring which resists hard blows—reduces wear and repairs!

● **When you look at a section of Link-Belt roller chain, you know it has *everything!* Its brilliant beauty is in keeping with its high quality and precision design. Its great strength, and durability assure dependable, low-cost service. Send for Engineering Data Book No. 1757.**

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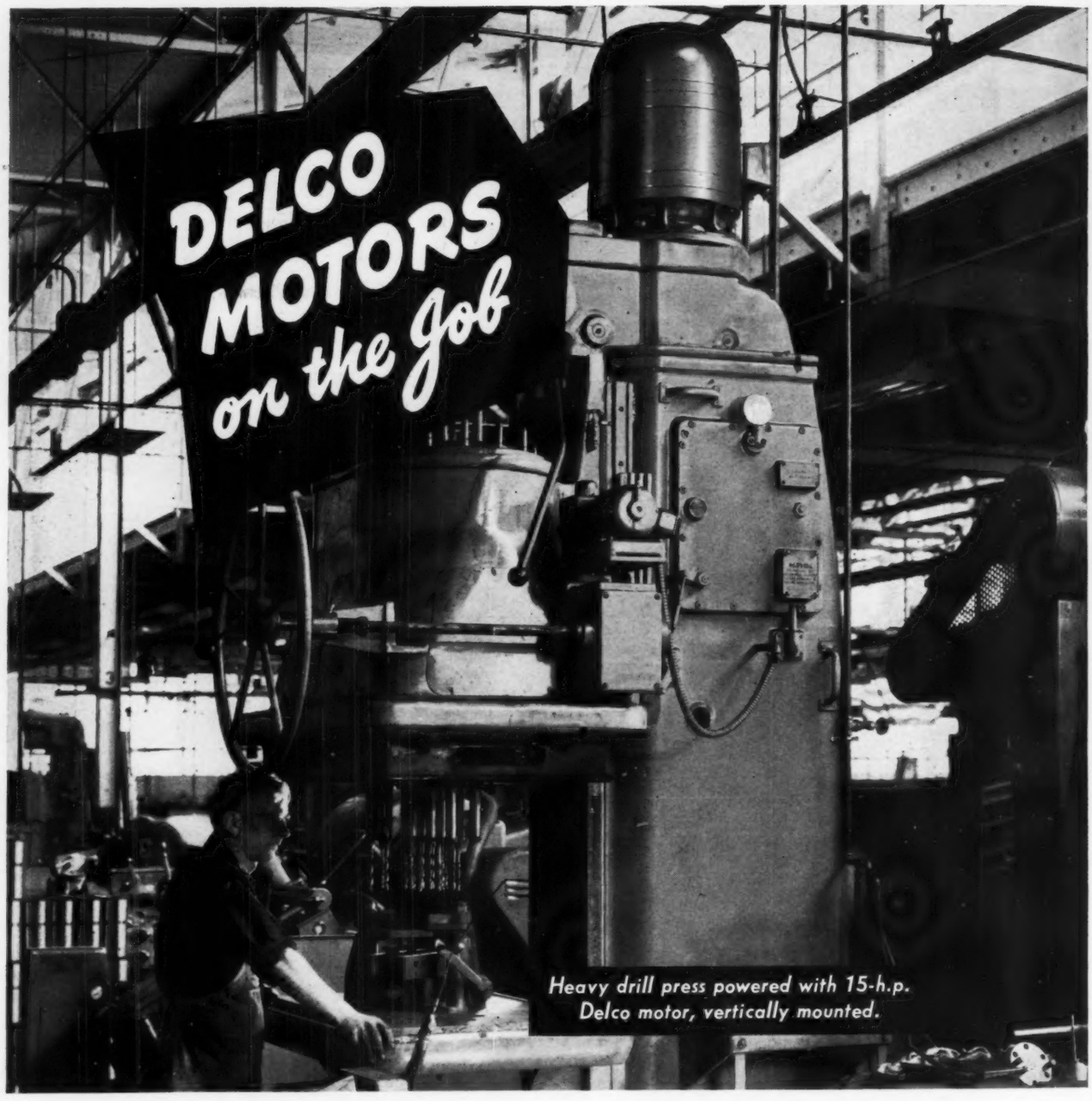
Leading Manufacturer of Mechanical Transmission Equipment—Silent and Roller Chains . . Speed Reducers . . Speed Variators . . Roller, Ball and Babbitted Bearings . . Collars . . Couplings . . Base Plates . . Take-Ups . . Clutches . . Gears . . Sprockets . . Hangers . . Shafting . . Pulleys, etc.

LINK-BELT *Silverlink* ROLLER CHAIN



Heavy drill press powered with 15-h.p. Delco motor, vertically mounted.

BUILT FOR HEAVY GOING

In plants all over America, machines are being called upon to turn out more work—operate longer hours.

Delco motors take to these heavy schedules like a "battle wagon" to a rough sea. That's the sort of going they're built for. It justifies the extra care that goes into the machining of Delco motors . . . the extra operations that make Delco motors cool-running and free from vibration. It gives rugged Delco motors a chance to show what they're made of—and made for!

Plant engineers and maintenance men find in Delco motors a dependable source of power for all machine tools. For low maintenance and long operating efficiency, specify Delco motors for your machine tool requirements.

Consult the Delco Products Engineering Department for recommendations.

DELCO MOTORS

DIVISION OF GENERAL MOTORS CORPORATION

DELCO PRODUCTS DAYTON, OHIO

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The Link-Belt Shafer line of "Friction Fighter" roller bearings is daily meeting the challenge to efficient power transmission.

Because of their unique roller and raceway design—concave and convex respectively—self alignment is assured. In the illustration above you can see that the inner race is a true spherical element—free to move in any direction without altering the contact between it and the roller. No other bearing can offer this advantage.

Friction Fighter bearings have the capacity to carry both radial and thrust loads, or combinations of both. There is no need for auxiliary means of taking thrust. Their free alignment action provides normal distribution of the load over the rollers, free from any pinching action. Free rolling is thereby assured. Send for Data Book No. 1775.

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LINK-BELT Friction Fighter BEARINGS

On guard!

TODAY the full force of America's industrial might is dedicated to the big job of arming this nation. Anything that speeds this job . . . helps. Anything that slows it . . . HURTS!

Even an unnoticed roof leak can cause costly delay by damaging raw materials, machinery and finished products.

On guard day and night on many of the country's most vital plants, Barber Genasco Roofs are helping to prevent this kind of "sabotage." And the reason for Barber in so many instances is because this roofing alone offers the added toughness and durability of Trinidad Native Lake Asphalt.

Adding Trinidad to any roof means a further assurance of long life and faultless protection. This age-old asphalt has an inherent mineral filler that increases its resistance to weather. It has unusual ductility and self-healing properties particularly valuable in built-up roofing, where they tend to seal up structural cracks that may develop through movement of the roof deck.

Barber offers a complete line of Trinidad Bonded and other types of built-up roofing, both smooth and gravel top. Barber also makes both mineral and smooth-surface roll roofing as well as roof-maintenance asphalts. And Barber prices are competitive. Call your Barber roofer or applicator. His name is in your classified telephone directory. Barber Asphalt Corporation, Barber, New Jersey.

BARBER PRODUCTS

BARBER

MEANS A GOOD ROOF!

MORE POWER *Continuously!*

IN THESE DAYS when every extra horsepower of energy counts, efficient operation is vital.

You will get more efficient, continuous service from your turbines, Diesels, reciprocating engines and auxiliaries when you use *Texaco Power Plant Lubricants.*

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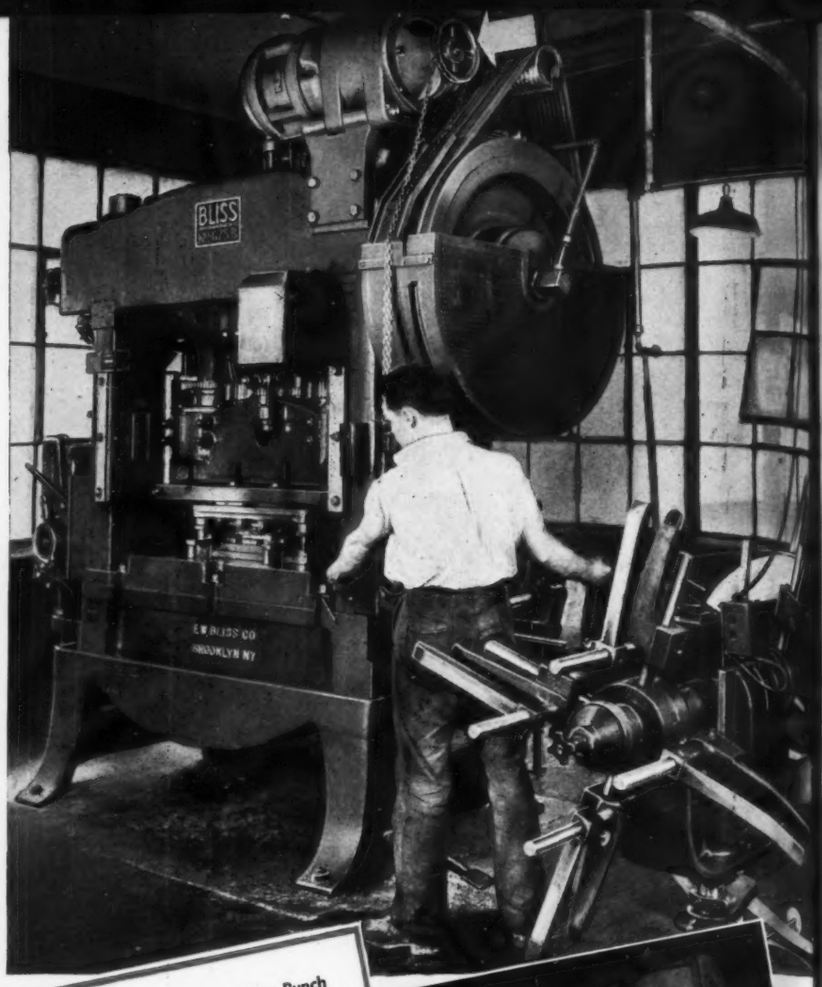
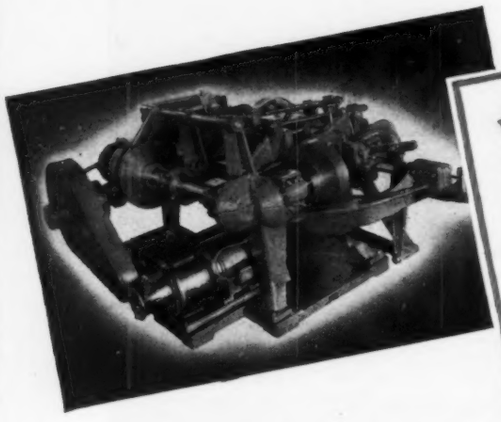
RETURN METAL DRUMS PROMPTLY . . . thus helping to make present supply meet industry's needs and releasing metal for National Defense.

Yesterday

When Rigid Economy Was Paramount

Then, when competition was at its keenest and the manufacturer with the lowest costs had his goods half sold, REEVES Variable Speed Control became firmly established in industrial production. The ability of the operator to run his machine at exactly the right speeds for best results, *then as now*, insured maximum production, with minimum waste of time and material. Both quality and quantity of output were improved and costly man-hours of labor were saved. Getting costs down and profits up was the order of the day in the thousands of plants where over 200,000 REEVES Speed Control units are in operation.





No waste of time or material on this Bliss Punch Press because the REEVES Motodrive instantly provides the proper speed for each job without stopping the press.

REEVES Motodrive varies speed of this Ribbon Stock Universal Forming Machine, built by A. H. Nilson Machine Co., to turn out a wide range of sizes and shapes of uniform quality at high rate of speed.

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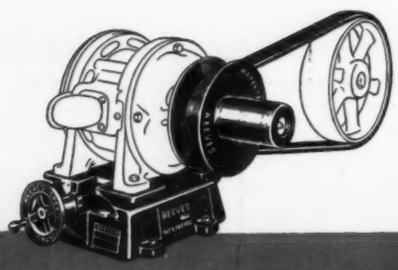
OVER 200,000 OF THESE REEVES UNITS IN USE

3 basic designs provide complete line for you to choose from



● **VARIABLE SPEED TRANSMISSION** for infinite speed control over wide range—2:1 to 16:1 inclusive—and for heavy-duty service. Fractional to 87 h.p. capacities. Vertical, horizontal, open, enclosed models.

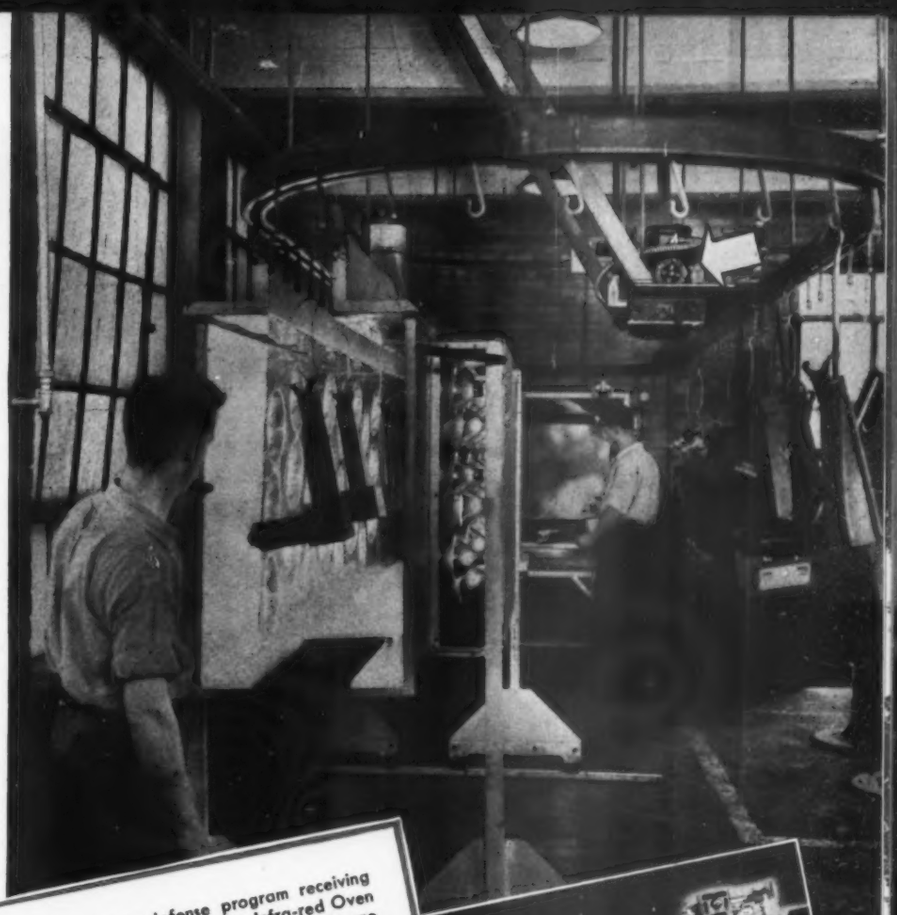
● **VARI-SPEED MOTOR PULLEY** for direct application to shaft extension of any standard constant speed motor and for ratios of speed variation not exceeding 3:1 range. Fractional to 15 h.p. capacities.

● **MOTODRIVE** which combines motor, variable speed drive and gear reducer (if required) in a single compact unit. Fractional to 10 h.p. capacities; speed range 2:1 through 6:1. Vertical and horizontal designs.

Today

When Production Must Hit a New Peak

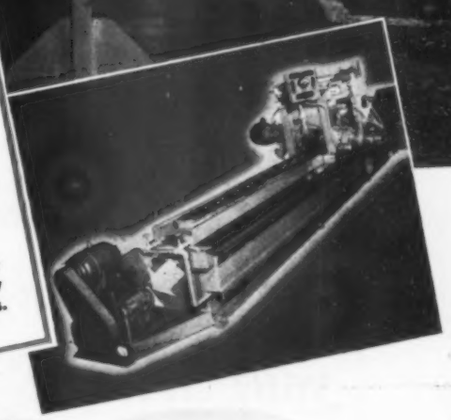
There is no time to waste *now*, with inefficient methods, with machines operating *too fast or too slow* for best results. Every man-hour of labor must be made to count. Every yard, pound or gallon of precious materials must be conserved. Production must reach a new peak but with no sacrifice of quality. REEVES Variable Speed Drives are a basic factor in accomplishing all these objectives, and we are putting forth every effort to supply REEVES units wherever needed for defense production.



Parts important in defense program receiving baked finish in Elliott Electric Co. Infra-red Oven under straight line production at plant of Reliance Gauge Column Co., Cleveland. REEVES Vari-Speed Motor Pulley varies speed of conveyor to provide baking cycles from 8 to 18 minutes according to finish, kind and size of product.

REEVES Motodrive controlling Rockwell Fuel-fired Rotary Annealing Furnace, with washing equipment, used in production of cartridge cups.

Spar Milling Machine, widely used in aircraft plants, equipped with REEVES Transmission, now does in 42 minutes work that formerly required 60 hours.



-and Tomorrow?

Tomorrow your company may be making an entirely different product, manufactured and sold under entirely different conditions. But this much is certain—there will be an important need for effective Speed Control, *to adapt present machines to new production demands.* REEVES infinitely variable, dependable Speed Control, *applied now*, will pay rich dividends in increased machine efficiency *after the war*, as well as in the present emergency.

REEVES PULLEY CO., Dept. F, COLUMBUS, INDIANA

Send for copy of helpful new 20-page book, "More Output for Defense," illustrating and describing 26 examples of how you can step up your production with accurate, infinite, variable speed control.

Minimum Waste—Maximum Production

REEVES Speed Control

"Please assign me one of your Secret Service Men"

NOT LONG AGO, the Technical Director of one of the world's great financial powers came to this country to consult with us on the redesign of a bank-note machine which Taft-Peirce had built for his institution many years ago. Of course, his mission was highly confidential, so he and one Taft-Peirce engineer disappeared behind locked doors. For three months, the two men worked together, alone, until the new design was completed. To this day, that engineer is the only man in the Taft-Peirce organization who knows what that machine is like.

Countless confidential missions have been accommodated in carefully segregated facilities within the Taft-Peirce Contract Manufacturing and Engineering Division. Countless types of machines have been developed, tooled and built in complete and permanent secrecy. Even now, such facilities may be made available to manufacturers with defense contracts holding suitable priority ratings. Write to The Taft-Peirce Manufacturing Company, Woonsocket, Rhode Island, and learn the unique advantages gained when you . . .

Take it to Taft-Peirce

HERE'S FLEXIBLE PUMPING POWER

IN ONE TIGHT PACKAGE...

Allis-Chalmers "Electrifugal" Pump Unit LEADS THE FIELD WITH 5 GREAT FEATURES And Cuts Your Costs Up To 33%!

LOOK at the outstanding engineering advancements of this "Tri-Fit" construction . . . its streamlined, compact design! One integrated frame with one precision-made driving shaft means fewer parts, fewer fits, better balance and smoother operation . . .

Even its motor has been specially developed for pump drive — far stronger mechanically and completely splash-proof.

Indestructible rotor and distortionless stator are removable for easy access and quick inspection. Large, sturdy ball bearings . . . splash-proof ventilation . . . cast bronze protective sleeve and cast aluminum fans are just some of the other outstanding features of this modern pump.

Best of all . . . *you can actually cut your initial costs as much as 33% over conventional pump installations.*

For the whole story of the money-saving facts on this "One Package" Pump . . . and how it can help you get *more gallons at less cost* . . . call the engineer in the district office near you. Or write Allis-Chalmers, Milwaukee, Wis., for Bulletin B-6140.

A 1420

CHECK THESE ALL-OUT ADVANTAGES AND SEE WHY:

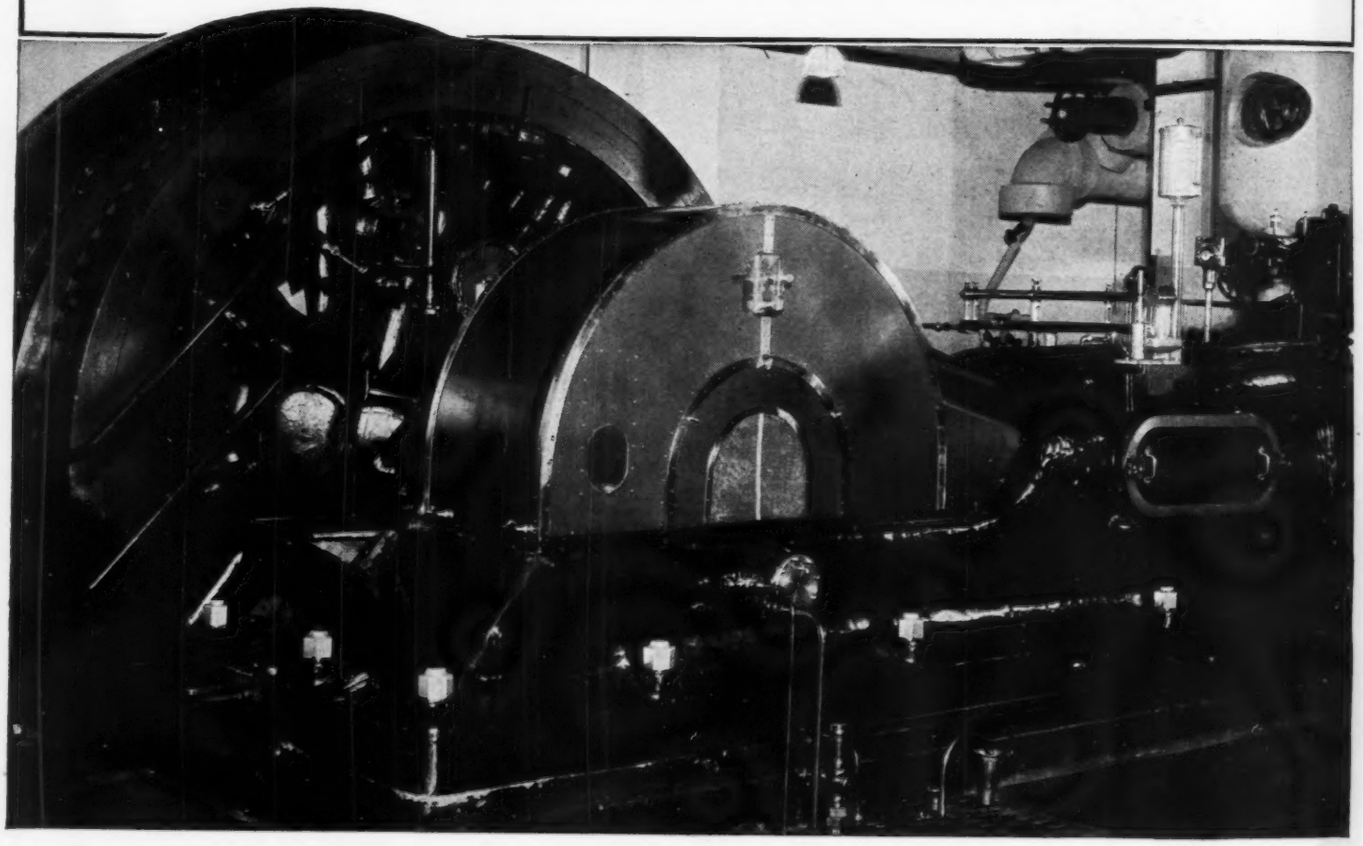
1. *Up to 33% Space Saved* with one frame, one solid driving shaft construction.
2. *Overhang Cut As Much As 40%.* Four solid supports assure precision balance . . . ease strain on vital parts.
3. *New "Tri-Fit" Design* eliminates 2 section fits for more positive shaft alignment, wear-less and vibration-free performance.
4. *Splash-Proof Motor* standard equipment . . . 100% designed for pumping.
5. *Easy-to-Get-at Casing* simplifies stuffing box and waterseal gland inspection.

Allis-Chalmers Pumps Can Handle "Anything that Flows"

ALLIS-CHALMERS
MILWAUKEE · WISCONSIN

Boilers and Exhaust Steam Stay Clean_

WITH GARGOYLE CYLINDER OIL IN YOUR ENGINE



CALL IN Socony-Vacuum for

YOU'LL BENEFIT FROM: 75 YEARS' LUBRICATION EXPERIENCE • PRODUCTS APPROVED BY ENGINE BUILDERS •

Here are two important operating advantages that Gargoyle Super Cylinder Oil 600-W offers you:

☞ Because this oil separates quickly from condensate, it minimizes oil in your boiler.

That means you get maximum heat transfer through boiler tubes.

☞ And because this high-quality cylinder oil lubricates your engines efficiently with minimum feeds, it helps keep exhaust steam clean.

Result—you get peak efficiency for heating and processing equipment.

GARGOYLE

Lubricants

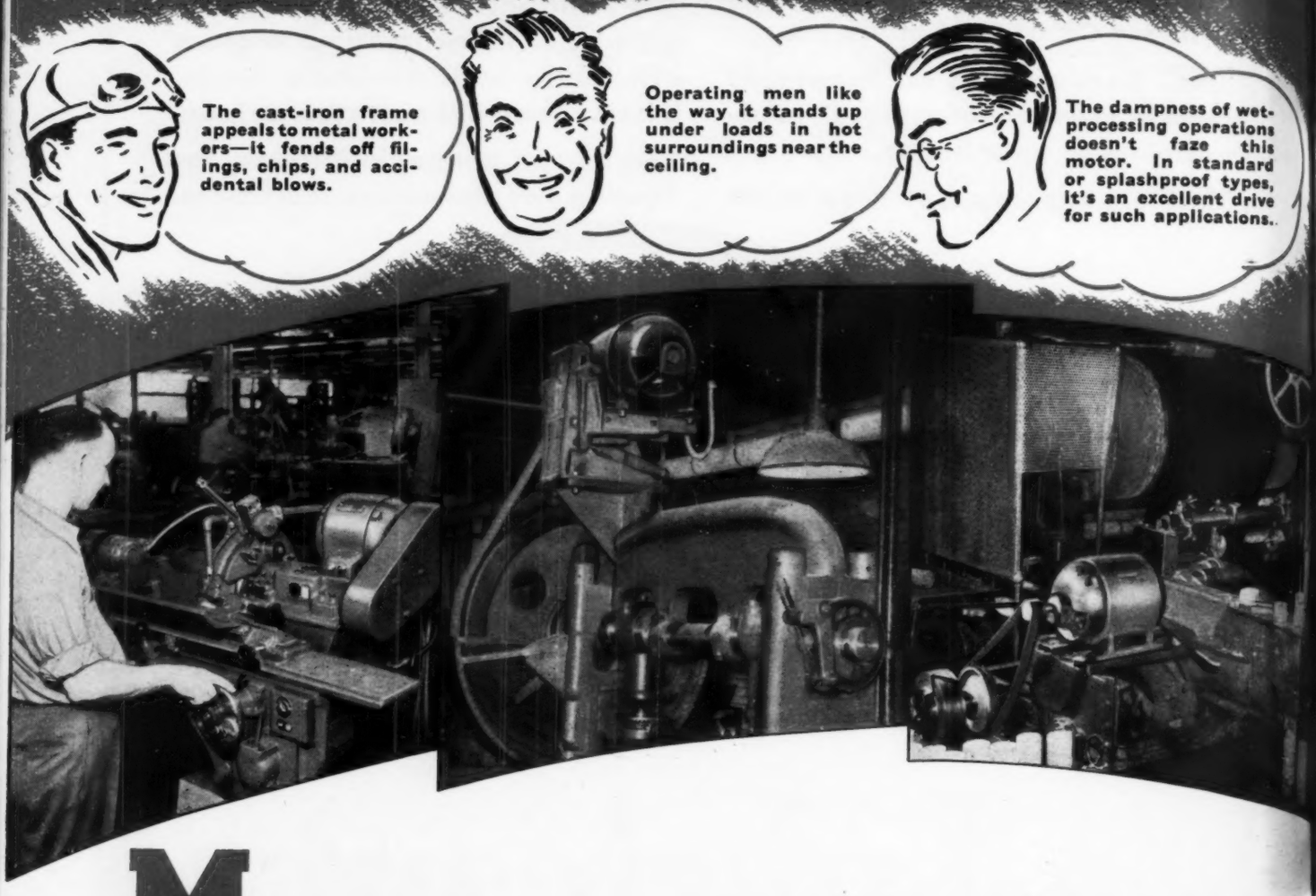
The Emblem of 75 YEARS' PIONEERING in "Correct Lubrication" 1866-1941

"Correct Lubrication"

THE RIGHT OIL FOR EACH JOB • NEW LUBRICANTS AHEAD OF NEW NEEDS •

SOCONY-VACUUM OIL COMPANY, INC. • Standard Oil of New York Div. • White Star Div. • Lubrite Div. • Chicago Div. • White Eagle Div. • Wadhams Div. • Southeastern Div. (Baltimore) • Magnolia Petroleum Co. • General Petroleum Corp. of Calif.

NOW YOU'RE TELLING US...


The cast-iron frame appeals to metal workers—it fends off filings, chips, and accidental blows.
Operating men like the way it stands up under loads in hot surroundings near the ceiling.
The dampness of wet-processing operations doesn't faze this motor. In standard or splashproof types, it's an excellent drive for such applications.

Motor users are proving the case

FOR TRIPLE PROTECTION.....MODERN DESIGN

ACTIONS speak louder than words. In the short time that they have been available, Tri-Clad motors have won a host of friends in a wide variety of industries because of the way they stand up under trying operating conditions. More significant, however, than the extent of their use are the applications in which Tri-Clad motors are seeing "front-line" service. Here are a few tough spots in which they are proving their mettle:

On equipment which must operate in hot or damp surroundings, or where the motor is subjected to flying chips or falling objects—*extra protection against physical damage* keeps these motors going in spite of this unavoidable abuse.

On equipment responsible for vital defense production—*extra protection against electrical breakdown* helps to assure continuity of operation 'round the clock.

On equipment which must perform month in and month out without babying by the maintenance crew—*extra protection against operating wear and tear* prolongs the years of smooth, quiet service.

On equipment which is expected to *look attractive* by virtue of smoothly contoured modern design, the functional styling of the Tri-Clad fits in perfectly.

Why not give Tri-Clad motors a chance to show you just what continuous, economical motor operation is? Next time you order a motor or a motor-equipped machine, specify Tri-Clad. *General Electric Company, Schenectady, N. Y.*

GENERAL ELECTRIC

750-92-8058

...WHY TRI/CLAD IS TOPS

REG. U.S. PAT. OFF.

Plant men find Tri-Clad motors easy to maintain. Lubrication features facilitate quick oiling or greasing. Smooth contours can be readily cleaned.
Tri-Clad motors are a cinch to install. Electricians like them because of the roomy conduit box and the permanently identified terminals.
Machine builders and buyers both like the way that these motors blend in with the neat, attractive appearance of modern machines.

GENERAL ELECTRIC

TRI/CLAD

MOTOR

Tri-Clad induction motors are now being produced in 16 fundamental electrical types and 8 basic mechanical constructions. Call your local G-E motor representative for information on availability of types and sizes to meet your needs.

BUILT FOR PROTECTION FIRST...TO LAST!

"—but why use my picture?"

asks COTT FARRELL, V. P.

"WHY use my picture, Rich? Why don't you show something we make—industrial cars, electric trucks or trailers for instance?"

Rich: "We want our friends and customers to read this advertisement. They know our products. I would like them to get the human side of our work. This ad is you in person, telling what is being done to expedite their orders — explaining how we can help them in other ways."

Cott: "Nothing new there. Our customers and our suppliers all face the same problems in this emergency. They all have their expediting departments. Our sales engineers are acting as liaison men between our suppliers and our purchasing department. They're cutting red tape, following up on our orders, working to get shipments through on materials. But everybody is doing the same thing."

Rich: "Extra work helps all-'round."

Cott: "All industrial salesmen are taking on extra work these days. Since early this year our men have been scouting for idle shop facilities within a thirty-mile radius of our plant. At present we have thirteen shops adding to our capacity. It takes time to train them to our way of doing things but we are getting results."

Rich: "—and making deliveries."

Cott: "Of course our increase in production capacity is due mostly to increased facilities in our own shop. Improvements like that new welding equipment you saw this morning, and the new runway those men are working on now. That will speed up receiving and shipping. But our biggest worry is getting materials fast enough to keep all our men at work. Many of our friends are faced with the same difficulty."

Rich: "How can we help them?"

Cott: "One thing we probably do more of than most companies is engineering counsel. That's because of the nature of our business. We don't sell many standardized products. Most of our sales are to meet highly specialized requirements, jobs that call for the contact of top-flight handling experts. Our men have been trained that way, and now, with more time for survey work, they have been able to help our friends in many ways. They're helping to get faster, better service with old equipment. In one typical case our man helped a manufacturer to rebuild a lift-truck in the customer's own shop to smash a serious bottleneck. That kind of counsel is always free to our friends. You might say that we are doing more counsel and less selling."

Rich: "We're taking new orders."

Cott: "And we're not holding back on new ideas. Our engineering department is on its toes, developing and testing new ideas every day, and putting them into production as soon as they are ready. And our sales engineers are like a field laboratory. They maintain an active interest throughout the life of every unit they sell. That's where many of our most important improvements are started."

Rich: "There's extra value."

Cott: "Even so, we're keeping prices as close to the bone as possible. But there's nothing new in what I've told you. It's just what we have been doing for the last twenty-five years—and what we hope to keep on doing. Only today it's more counsel and less selling."

J. C. (Cott) Farrell, V.-Pres., and F. A. (Rich) Richardson, Adv. Mgr.

Rich: "That is what we have been calling 'Counsel for Defense' in ads with pictures of our other sales engineers. May I use your picture, Cott?"

Cott: "You're the advertising manager. You decide. Well, so long, Rich. See you Tuesday."

★ ★ ★

COUNSEL *for* DEFENSE

When an Easton Sales Engineer calls on you why not invite him to look over your material handling and storage facilities. Perhaps he can give you ideas for immediate speed-ups and short-cuts. For information write to Engineering Counsel, Easton Car & Construction Co., Easton, Pa.

EASTON-ENGINEERED MATERIAL HANDLING EQUIPMENT
INDUSTRIAL CARS AND TRAILERS FOR EVERY PURPOSE
ELECTRIC TRUCKS • SEMI-TRAILERS • TRUCK BODIES, ETC.

EASTON

INCREASES BELT LIFE *26 Times*

—on belt-blitzing drive!

DOWN at the Harmony Grove Mills in Commerce, Georgia, there's an air compressor drive which at one time was a real belt killer. Due to the narrow faces of the pulleys, belting of extra thickness was used. This caused ply-separation in even the best-grade conventional belts, cutting service life to a three weeks' average.

Finally, the G.T.M. – Goodyear Technical Man – was asked to specify a belt strong enough to drive the load, yet flexible enough to bend easily around the small 5½" drive pulley. He recommended a Goodyear COMPASS "40." This belt gave trouble-free service for eighteen months – just 26 times as long as the best previous belt. And at a smaller outlay, too! What's more, the replacement belt was another COMPASS, which, at this date, is on its way to a new record for the drive.

The reason is: COMPASS belts are 25% thinner than others of equal horsepower capacity – insuring far less internal friction, longer flex-life and an ever-tight, speed-holding grip on the pulleys.

Why not let the G.T.M. apply the advantages of patented COMPASS construction to your belt problems? A line will bring him to your plant. Write Goodyear, Akron, Ohio or Los Angeles, California – or phone the nearest Goodyear Mechanical Rubber Goods Distributor.

THE GREATEST NAME IN RUBBER

GOODYEAR

Compass—T. M. The Goodyear Tire & Rubber Company

AIR... the Warrior !

Air—the magic carpet on which parachuters speed to battle! *Air*—the highway on which great 70 ton bombers roar to the substratosphere! *Air*—the transmission line through which radio's voice flashes! *Air*—that speeds production in countless plants vital to defense!

Yes, AIR is in the thick of the battle on many fronts—fighting, defense, production!

Imagine an entire 50 acre airplane engine plant—completely air conditioned! Well, there it is below—the world's largest. You can bet your boots it's sealed tight against dirt and prying eyes. And that's made possible by flooding the whole 50 acres with clean, comfortable conditioned air—circulated by 161 giant Sturtevant fans.

Then, there's the new Ford engine plant, where intricate engines that are marvels of precision flow from the assembly line like meat from a grinder. Here, to keep efficiency at a high pitch, Sturtevant equipment cleans and circulates 3380 tons of air per hour.

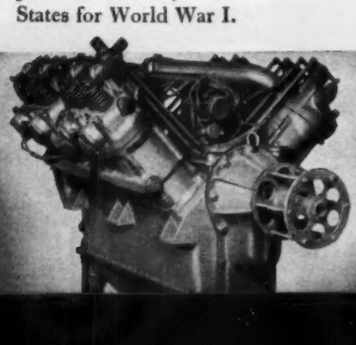
How about simulating actual flight conditions *on the ground?* Impossible? Not at all! See it in the famous Pratt & Whitney Engine test house—where Sturtevant air equipment is used for this purpose and to carry off lethal exhaust fumes.

These are merely typical examples. The list is endless.

Today—Sturtevant air handling equipment keeps airplane and engine plants humming—and ventilates and heats giant bombers. *25 years ago*—Sturtevant designed and built

Sturtevant
REG. U. S. PAT. OFF.
Puts Air to Work
in the Aviation Industry

"V-8" AIRCRAFT ENGINES made by Sturtevant as early as 1910, represented first use of aluminum alloys for airplane engine heads—and used on planes supplied to Britain, Russia and United States for World War I.



STURTEVANT "SCOUT" OF 1916—designed and built by Sturtevant Aeroplane Company, subsidiary of B. F. Sturtevant Company—the first plane incorporating steel construction and forerunner of today's all-metal planes.

the first planes to use steel construction. From the pioneer days up to the present time, Sturtevant has conspicuously served the Aviation Industry.

B. F. STURTEVANT COMPANY

Hyde Park, Boston, Mass. *Branches in 40 Cities*

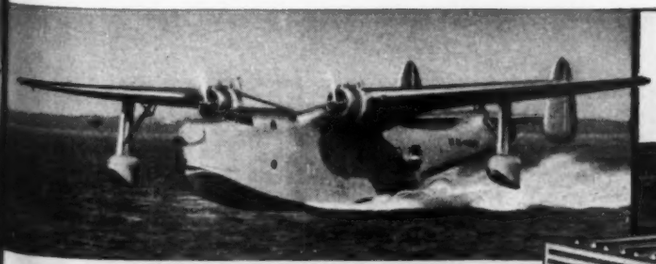
B. F. Sturtevant Company of Canada, Ltd., Galt, Toronto, Montreal

Sturtevant

REG. U. S. PAT. OFF

Puts Air to Work

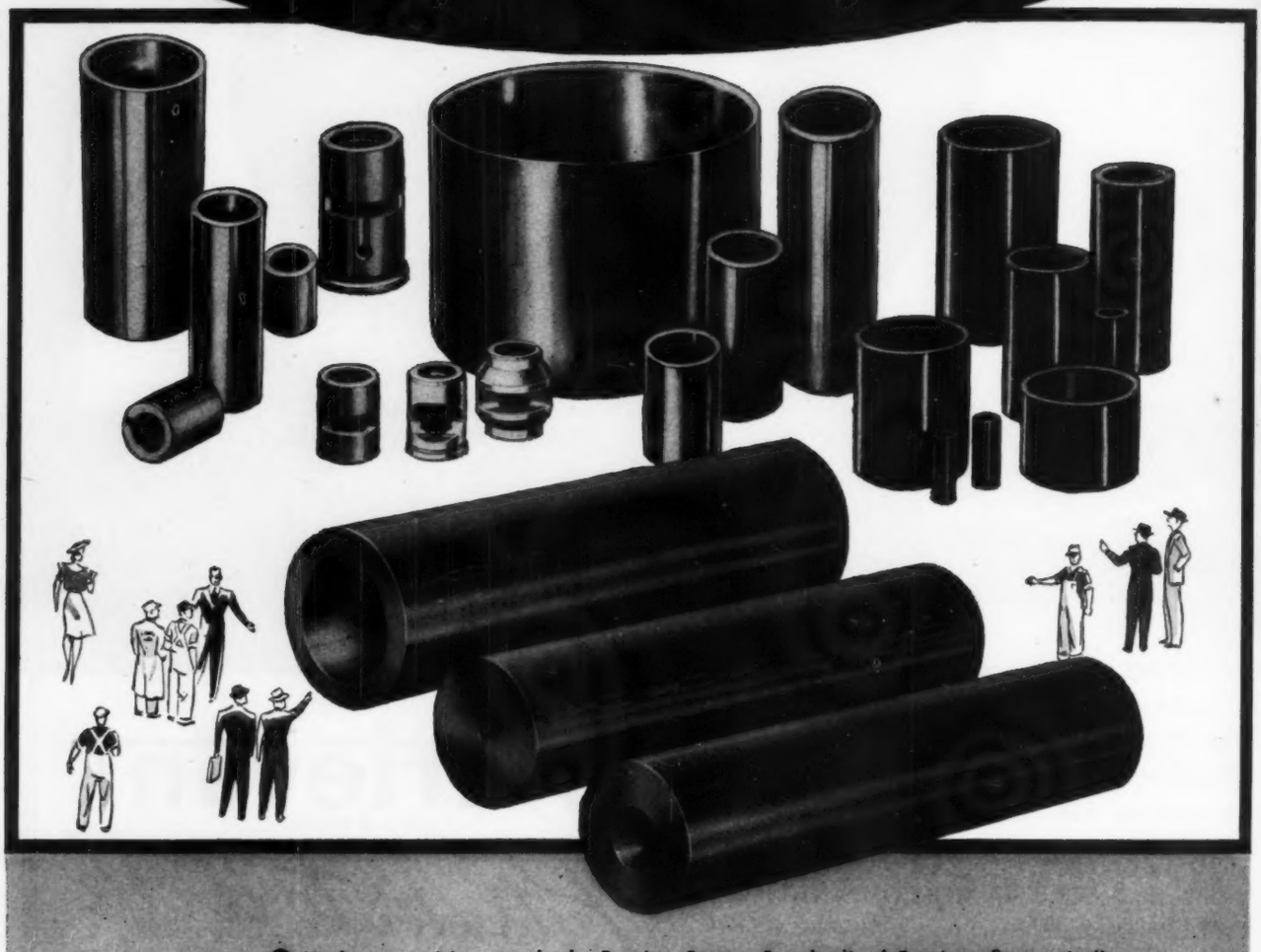
STURTEVANT — FOUNDER OF THE AIR HANDLING INDUSTRY



ONE OF THE MODERN NAVY BOMBERS equipped with Sturtevant heaters and ventilators to maintain desired temperature and air conditions for officers and crew, regardless of outside weather.

50 ACRE, COMPLETELY AIR CONDITIONED Wright Engine plant at Cincinnati, Ohio, where 161 giant Sturtevant Fans circulate more than 7000 tons of air per hour!

BEARINGS FOR EVERY MACHINE... Plenty for Everybody



● Made to precision standards, Bunting Bronze Standardized Bearings fit practically all applications in machine tools, industrial machinery and electric motors. Easily engineered to special jobs, they fit many unusual applications. For such adaptations our engineering and research facilities are at your command without cost or obligation. Bunting Bronze Tubular and Solid Bars, completely machined I. D., O. D. and Ends, also are available from stock in hundreds of different sizes. Ask your wholesaler or write The Bunting Brass & Bronze Company, Toledo, Ohio. Warehouses in All Principal Cities.

WRITE FOR THIS 64-PAGE CATALOG OF BUNTING BRONZE STANDARDIZED BEARINGS AND BARS, INSTANTLY AVAILABLE FROM STOCK

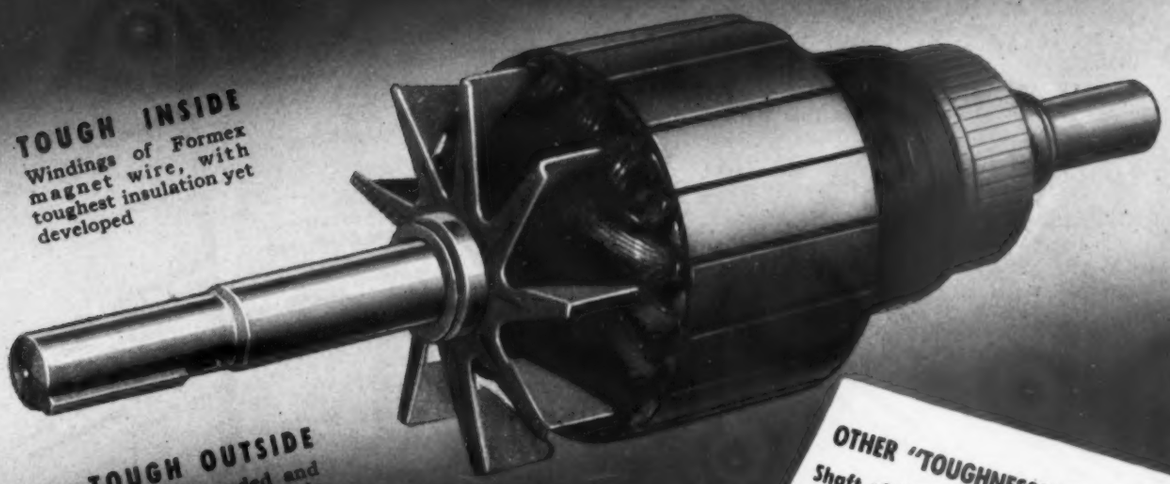
BUNTING

BRONZE BUSHINGS
PRECISION BRONZE BARS

BEARINGS
BABBITT METALS

TOUGH from the INSIDE OUT

ARMATURE OF THE NEW G-E D-C MOTORS



TOUGH INSIDE
Windings of Formex magnet wire, with toughest insulation yet developed

TOUGH OUTSIDE
Windings bonded and protected by durable Glyptal synthetic resins

OTHER "TOUGHNESS" FEATURES
Shaft of high grade steel, accurately machined, and with ample fillets to withstand severe mechanical shock • Core of annealed, nonaging silicon steel • Laminations tightly held by welded end fingers • Positive ventilation system

Construction of This Dynamically Balanced Armature Reveals New G-E Methods of Building Vital D-c Motor Parts to Give Long, Heavy-duty Service

EVERY General Electric d-c motor armature has *inner* and *outer* protection against damage from abrasion—heat—aging—oil—alkalis—mild acids. Insulation of the Formex wire windings permanently retains its high dielectric strength. It is at least three times tougher, more flexible, and much more resistant to abrasion than conventional enamel. It shows no tendency to become brittle, crack, and lose its toughness on long exposure to heat. And the heavy, baked-in coat of Glyptal base varnish binds the windings into a solid mass that's highly resistant to mechanical injury.

Careful attention to materials and design extends to every vital part of G-E direct-current motors. Built-up commutator; heavy, adjustable brush rigging; Formex wire field coils; and improved bearings—all are built to withstand severe operating conditions.

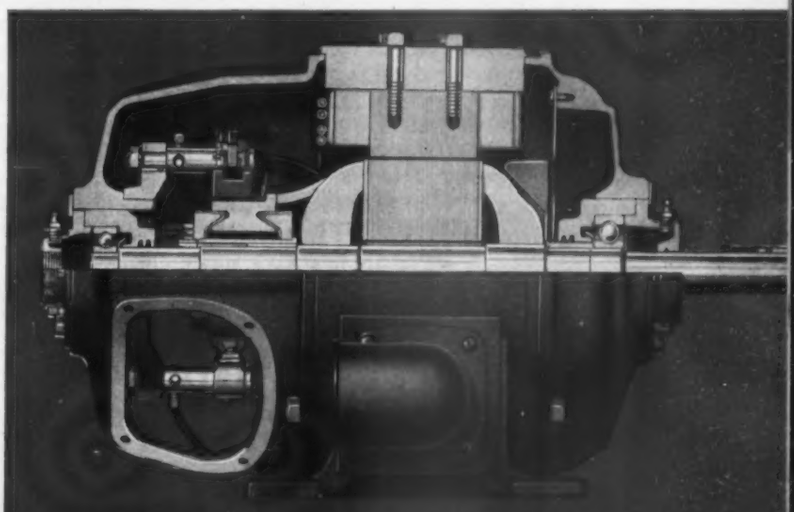
Call or write your G-E office for complete details on this outstanding new motor. And ask for your copy of GEA-1542D. General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

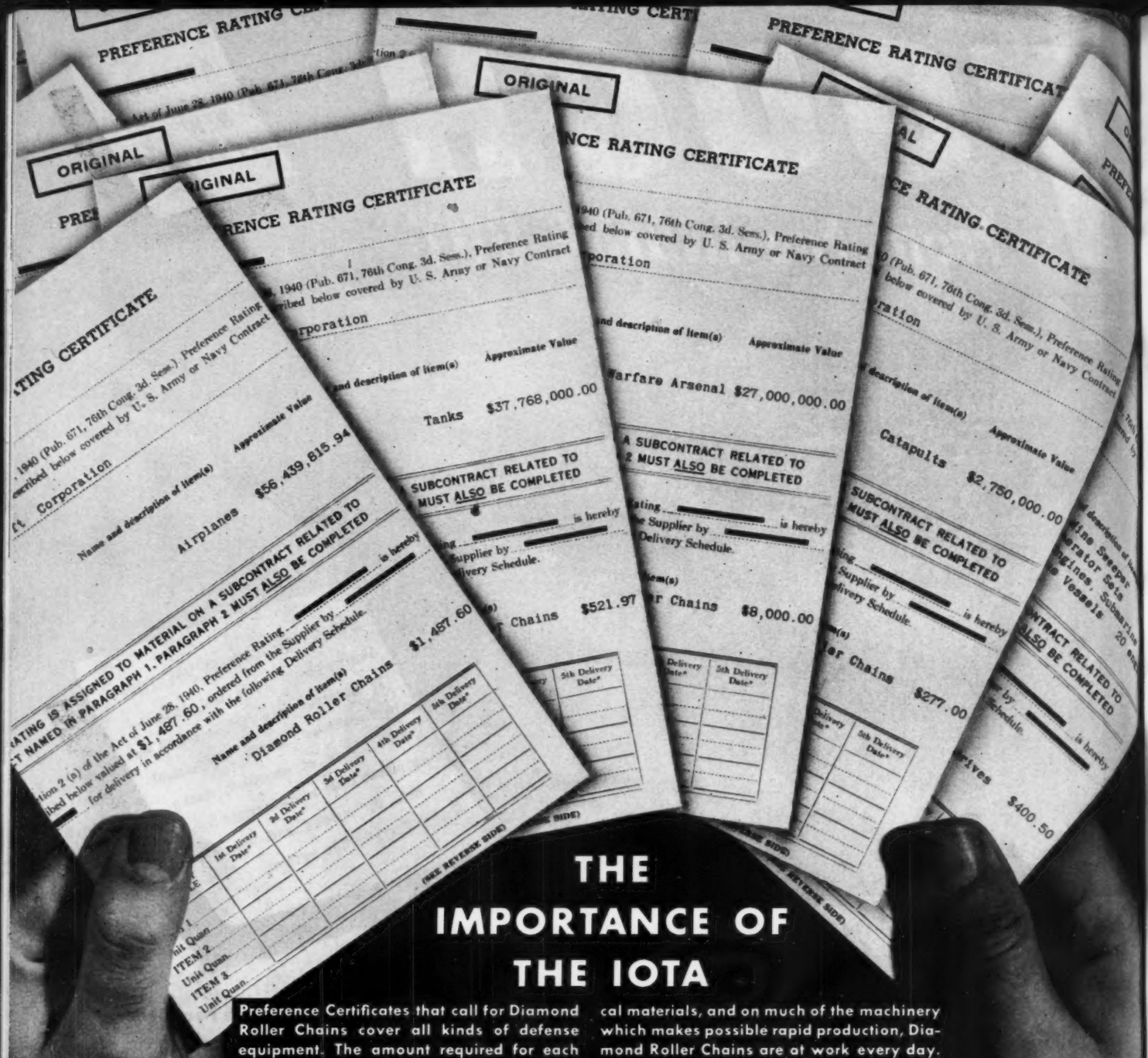
750-72-8598

Note This Motor's New Convenience Features

Reversal without changing any part of frame, fan, or brush rigging—Ventilating fans specially designed for efficient cooling regardless of direction of rotation—Compact assembly—Lower WR^2—Small diameter—Ball- and sleeve-bearing brackets interchangeable on the larger motors.



Sectional view, ball-bearing d-c motor (Type BJ). Open motors are available with ball or sleeve bearings in constant-speed ratings from ¼ to 50 hp; in adjustable-speed ratings from ¼ to 15 hp.



THE IMPORTANCE OF THE IOTA

Preference Certificates that call for Diamond Roller Chains cover all kinds of defense equipment. The amount required for each unit is insignificant in size and cost—but their importance is measured by the vital nature and wide variety of the jobs they do.

Operating the bomb release mechanism on heavy bombers, gun turrets on fighter ships, controls on all types of planes—the ratio of size and cost to the prime contract, is illustrated by certificates showing such figures as —"airplanes, $56,000,000; roller chains, $1487.60"—yet the accurate striking power and "maneuverability" of each plane are dependent upon the sure functioning of a small bit of roller chain.

On submarines, mine sweepers, cruisers, airplane carriers—tanks, amphibian tractors —in arsenals and in the mills producing critical materials, and on much of the machinery which makes possible rapid production, Diamond Roller Chains are at work every day.

True, the amounts are small compared to the size of the projects—$825 to $12,000,000; $3657 to $22,000,000; $7580 to $9,000,000 —to select a few—but they are doing the kinds of jobs usually extremely essential to successful performance.

For such vital duties there can be no compromise with quality—and Diamond is proud of the specialized skill that has made Diamond Roller Chains the recognized standard of quality the world over. Precision-made on specially designed machinery, Diamond Roller Chains are the result of over a half century experience devoted entirely to this ONE class of product. DIAMOND CHAIN & MFG. CO., 449 Kentucky Ave., Indianapolis, Indiana.

DIAMOND ROLLER CHAINS

NO. 9

ALUMINUM, DEFENSE, AND YOU

SIX MORE PLANTS IN FIVE STATES ON THE WAY

DEFENSE PLANT CORPORATION OWNS THEM. We've been designated to build them . . . fast.

Actually, when the names went on the dotted lines of the contract on August 19, we had already placed more than $16,000,000 worth of orders for some of the equipment and materials it takes longest to make and get.

FIVE OF THESE PLANTS will smelt aluminum. Their combined capacity is planned for more than 500,000,000 pounds a year, which is greater than the nation's entire production of aluminum in 1940. Locations: Massena, N. Y., Spokane, Wash., Troutdale, Ore., Los Angeles, and in the State of Arkansas.

The sixth plant will refine alumina from bauxite. Its billion-pounds-a-year capacity adds 58% to the nation's alumina capacity. It will be located at Bauxite, Arkansas.

HOW GOES CONSTRUCTION? At this writing, as fast as title is secured to the sites, contracts are being let for grading and foundations so as to be ready for the structural steel, which is coming as rapidly as it can be gotten.

What is more important, the aluminum plants are scheduled to deliver ingot by the summer of 1942; the refining plant to deliver alumina in early summer, 1942.

WE'VE ASSIGNED a large staff of men full time to headquarters engineering, purchasing, and accounting on this government building job.

We're sending competent and experienced management men out on these jobs as superintendents and other staff executives on construction, and for subsequent operation of such of these plants as we are designated to operate.

EVERY KNOWN IMPROVEMENT in design and construction and equipment is being incorporated in these plants. We intend that every dollar that will be spent shall be the best dollar's worth that experience can build. We do not make one cent of profit from this assigned job of construction.

We think we know how to get the government value-received for its money, because we are completing the expenditure of more than $200,000,000 of our own money in an expansion program which started after the beginning of the present war. Some of this expenditure is in new alumina and aluminum plants which will bring our own Alcoa capacity up to more than 700,000,000 pounds a year. The remainder is in tremendous expansion of facilities for fabricating every form of aluminum.

DEFENSE, GENTLEMEN, is getting its aluminum.

ALUMINUM COMPANY OF AMERICA

A Dark Picture of NATIONAL DEFENSE

A dark side of National Defense is that eye accidents are slowing up the vital production of planes, tanks, guns, ships. Last year *eye accidents* alone resulted in the loss of 8,455,000 man-days—a figure which is 30% greater than the time lost by strikes during the same period . . . a figure which is a national *disgrace.*

Do *your* part to make this picture *bright.* Protect all your workers, men and women, with safe, comfortable, American Goggles—goggles that have the *extra* impact-resisting protection of Deep-Curved Super Armorplate Lenses, ground, if desired, to individual prescriptions. Call in your nearest AO representative today.

American Optical Company

Southbridge *Massachusetts*

Iron Horses Talk and Hear

A—Connector plug—sawed, turned, and drilled.
B—Coil form—turned, milled, and threaded.

The speed, numbers and tactics of modern tanks make radio communication necessary for effective action. • Communicating systems represent only one of many defense applications for which the Bakelite-laminated industry produces dependable insulation. The industry is working at capacity producing parts of all kinds for the Defense Program and for essential industry. SYNTHANE CORPORATION, OAKS, PENNA.

SYNTHANE TECHNICAL PLASTICS

SHEETS • RODS • TUBES • FABRICATED PARTS

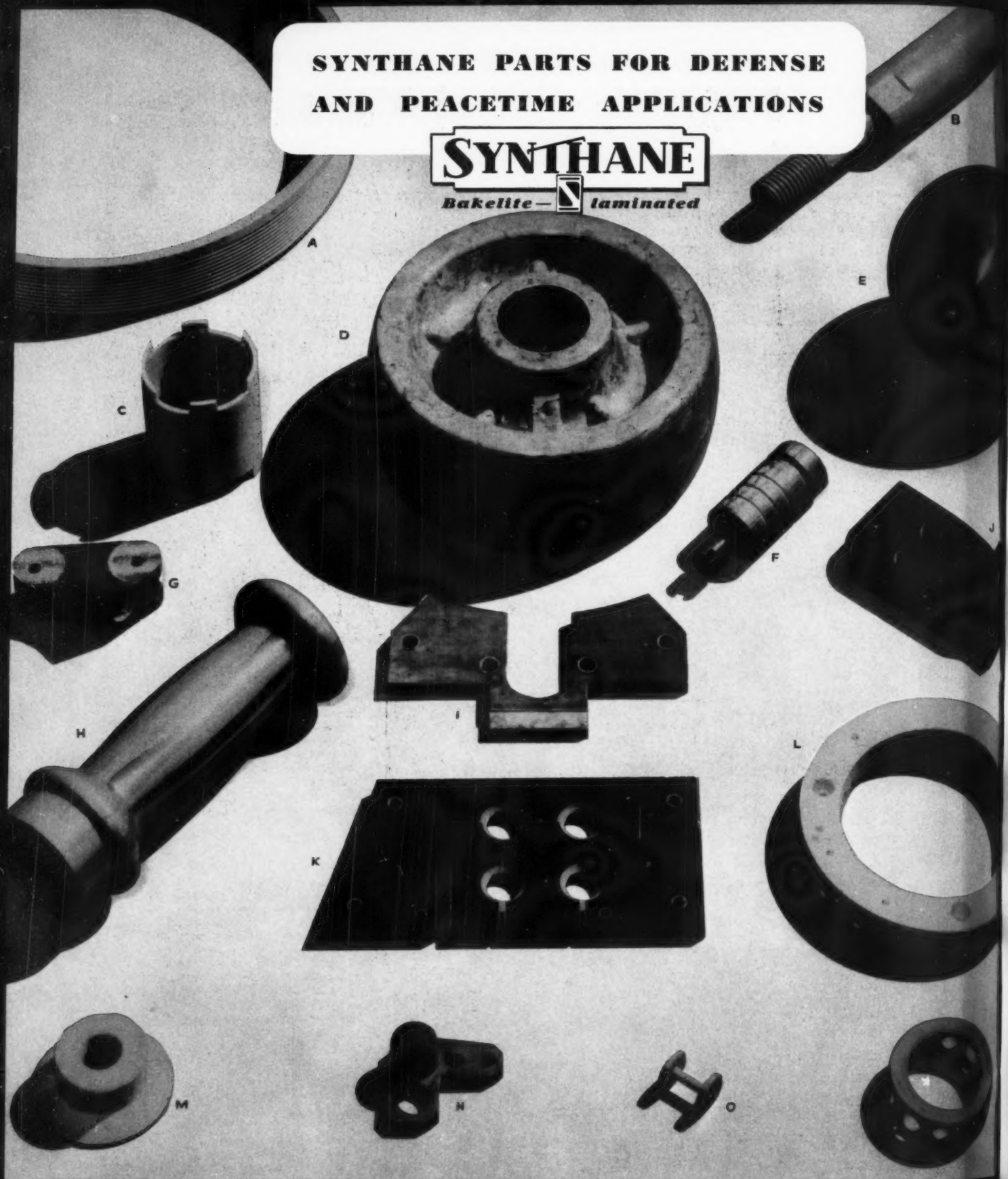
SYNTHANE
Bakelite—laminated

SILENT STABILIZED GEAR MATERIAL

SYNTHANE PARTS FOR DEFENSE AND PEACETIME APPLICATIONS

SYNTHANE

Bakelite — laminated



A — Airplane radio loop form
B — Rod for bottle washing machine
C — Variometer stator
D — Molded-macerated truck wheel
E — Molded-macerated valve check ball
F — Airbrake piston
G — Aircraft part
H — Handle for hosiery ironing device
I — Aircraft propeller part
J — Aircraft part
K — Airplane fairlead
L — Brush holder bracket
M — Plug end, rayon industry
N — Aircraft part
O — Radio coil spool
P — Ball bearing retainer

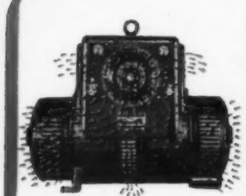
SYNTHANE CORPORATION, OAKS, PA.

Let "Simplified" ARC WELDING

Speed Up Your Production

• Defense activities are demonstrating that arc welding speeds up production like no other method of metal fabrication . . . and industry has discovered that only with "Simplified" Arc Welding can you get faster welds easier while guaranteeing quality. Here are the reasons

EXCLUSIVE REMOTE CONTROL Originated by Hobart, this feature enables the operator to take the convenient control dial to the work, regardless of how far he may be from the machine, and make heat adjustments and corrections without returning to the welder. It saves time, guarantees better welds.



FASTER Hobart end-to-center cooling system changes the air twice as often as the conventional end-to-end system. This feature, coupled by Hobart's liberal use of copper and restrained operating speed of the "Simplified" Arc Welder, guarantees faster and more continuous welding without the danger of overheating.

SIMPLIFIED With the Hobart Multi-Range Dual Control you get immediate choice of 1,000 combinations of welding heat without a single "dead spot". These combinations are just as easy to get as the right station on your radio. With this selection you can obtain the exact heat you want for light, medium or heavy welding work.

EASIER TO OPERATE Convenient "start" and "stop" push buttons; handy polarity switch; voltmeter and ammeter; large control dial . . . all simplify the operation of the Hobart Welder. Any welding operator with average experience will find it easy to produce the high quality welds that guarantee a better product.

BETTER WELDS Hobart's built-in, oversize four-pole exciter guards against arc-interruption or reversals and greatly simplifies the selection of desired polarity. Two or more "Simplified" Arc Welders can work on the same job without interfering with each other. You'll find it's easy to get better welding with fewer starts and stops.

HOBART WELDING RODS are available in a size and type for every conceivable arc welding requirement—on all types of metals and alloys. Ask for catalog EW-68 on complete Hobart line.

HOBART

"Simplified" ARC WELDERS

THE FASTEST SELLING ARC WELDER ON THE MARKET TODAY

• **HOBART BROS. CO.,** Box FM-121, **Troy, O.**

☐ Please send this new Arc Welding Book at once. Send details on items checked below:

☐ Electric Drive	☐ "Build Your Own"
☐ Gasoline Drive	☐ Hobart Electrodes
☐ A.C. Arc Welder	☐ Welding Trade School

I'm interested in_____amp. capacity.

NAME_____

ADDRESS_____

SULLIVAN Package Type COMPRESSORS

FROM FLATCAR TO S IN 24 HOURS

Plus

IMPORTANT ECONOMIES IN INSTALLATION AND OPERATION

WHEN you want PERMANENT LOW COST COMPRESSED AIR INSTALLED IN A HURRY, call for a Sullivan Package Type Compressor. Complete and assembled, ready to connect to power, water and air lines. Many have been installed within 24 hours after reaching the plant. In many cases where rapid plant expansion prevented normal planning—ability to install quickly is a definite advantage. When you want AIR ECONOMICALLY, call for a Sullivan Package Type Compressor. It requires half the floor space of the old bulky compressor and only one-fifth or one-sixth the foundation.

When you want efficient air performance, call for a Sullivan Package Type Compressor. Sullivan's *sound engineering* has produced balanced design and vibrationless operation... makes greater use, than any other compressor, of *modern,* high tensile alloys such as Hytenite, Meehanite and Mocasco... uses no casting of less than 35,000 #/sq. in. tensile strength... employs Sullivan patented 'Dual-Cushion" Valves and selective, Vacuumatic Multi-Cycle Control, super finished surfaces and numerous other long-life, advanced design features. In the span of six short years since Sullivan Package Type Compressors were introduced, hundreds of installations have been made in defense and industrial plants of every kind.

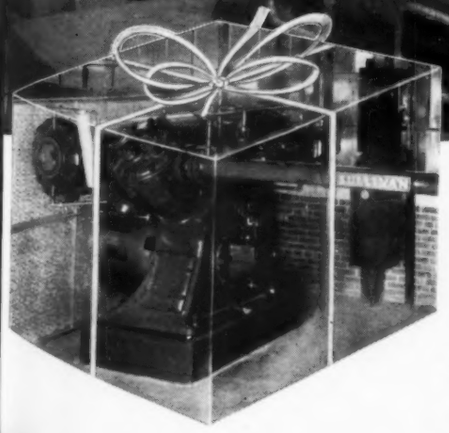
When you want air from 378 to 3656 C. F. M. at greatest economy of cost and maintenance with maximum dependability and long life, call for Sullivan Package Type Air Compressors. Send your specifications now, or ask for Bulletin A-38.

SULLIVAN

Air COMPRESSORS

Sullivan PACKAGE TYPE COMPRESSORS

are two-stage, double acting, long-lived, heavy duty, continuous service compressors—much smaller than old style compressors of the same capacity—and yet have operating economies equal to or exceeding those of the older bulky units of the same capacity. PACKAGE TYPE compressors need only to be hooked up to power, water and air lines and they are ready for 24-hour per day constant and efficient service. They are particularly suitable for synchronous motor drive and extremely well adapted for drive from steam turbines or diesel engines.



WN-114 Package Type Compressor in West Coast Plant of large Steel Company. (3 more units now being installed). WN-114's are 4 cylinder compressors—made in 4 sizes, in single and twin units. 175 to 600 h.p. 1092 to 3656 C.F.M. Floor space 9 feet x 10 feet. Foundation 5 feet x 8 feet.

●

WN-112 Two Cylinder Package Type Compressor 378 to 1828 C.F.M. Maximum space requirements 8 feet long, 6 feet 8 inches wide; foundation 4 feet 2 inches long; 2 feet 11 inches wide.

ninetieth 90th ANNIVERSARY 1851 SULLIVAN MACHINERY 1941

ANTICIPATE TOMORROW'S NEEDS TODAY!

Faced with a double duty—of discharging its responsibility toward defense work and of discharging its responsibility to its customers, Sullivan requests that you place your orders as far ahead of need as possible.

SULLIVAN MACHINERY COMPANY *Executive Offices:* MICHIGAN CITY, INDIANA

FACTORIES: MICHIGAN CITY, IND. • CLAREMONT, N. H. • DUNDAS, ONT. • GRANTHAM, ENG.

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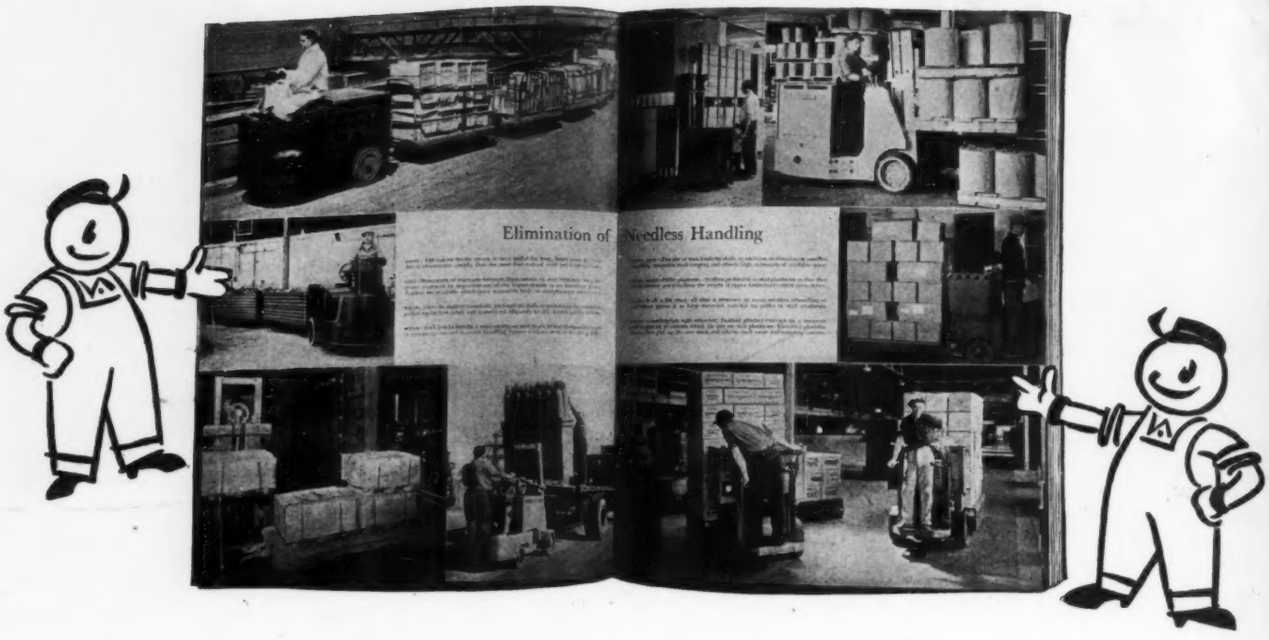
PRODUCTS

HEAVY DUTY, SINGLE OR TWO STAGE STATIONARY AIR COMPRESSORS IN ANGLE, V-VERTICAL, VERTICAL OR HORIZONTAL TYPES IN SIZES FROM ¼ TO 3000 H. P. ALSO A COMPLETE LINE OF PORTABLE COMPRESSORS



YOURS *for the Asking!*

Yours for the asking is *Modern Material Handling,* 1941 edition, a 24-page 8½ x 11 illustrated booklet giving you much useful information on the tractor-trailer system, the skid-lift-truck system, the pallet-fork-truck system and various special industrial-truck handling systems. Tells you how to judge which one or combination of these systems is best adapted to your handling operations.

Also included is a condensed description of the advantages of steel-alkaline storage batteries as industrial-truck power units, useful recommendations as to selection of batteries for continuous 24-hour-a-day operation, electrical data and dimensions of trays, steel cradles, and demountable steel boxes for batteries ranging from below 10 kwh to above 60 kwh of rated capacity.

This booklet is useful not only to users of industrial trucks but also to those who are considering the installation of their first truck. Address Edison Storage Battery Division of Thomas A. Edison, Inc., West Orange, N. J.

Edison
STEEL Alkaline BATTERIES

"THEY THOUGHT I WAS FRESH-AIR CRAZY... BUT EVERY ONE OF THOSE COPPUS BLOWERS HAS PAID FOR ITSELF OVER AND OVER AGAIN..."

—*says this* Plant Superintendent, after a year's test of Coppus Blowers

ANOTHER CASE
WHERE COPPUS BLUE RIBBON PRODUCTS MAKE GOOD ON THE JOB

"Frankly, I was considered a crank about getting ventilating equipment for our plant . . . now, after a year's experience with Coppus Blowers, everyone here recognizes the increased efficiency of both men and machines. Specific results were lower sickness costs and higher working efficiency with fewer halts in production. A dozen Coppus Blowers in various places have been operating continuously for a year without repairs or trouble of any kind."

In reducing temperatures (often as much as 35°) around furnaces and motors, and in making dangerous confined spaces fit for labor, Coppus air-handling equipment has cured many cases of halting production and poor morale.

Whatever your requirement, Coppus has the right piece of equipment — not a "catch-all" for general use — *engineered especially for you.* The Blue Ribbon on a Coppus Blower, Exhauster, or Heat Killer means the same precision workmanship and careful inspection that are responsible for winning high honors in many industries today.

COPPUS

Coppus Engineering Corporation, 203 Park Avenue, Worcester, Massachusetts
Sales Offices in THOMAS' REGISTER.

Other Blue Ribbon Products in SWEET'S: air filters, gas burners, steam turbines, etc.

THESE COPPUS BLUE RIBBON PRODUCTS

Are
Designed for Your Industry,
Engineered for You

Just check on this coupon the equipment likely to fit your requirements. Mention your industry, and we will send you, without obligation, complete facts.

PLEASE SEND ME INFORMATION ON

Supplying Fresh Air to Men Working:

- ☐ in tanks, tank cars, drums, etc.
- ☐ in underground cable manholes.
- ☐ on coke ovens.
- ☐ on steam-heated rubber processes.
- ☐ around cracking stills.
- ☐ on boiler repair jobs.

COOLING:

- ☐ motors, generators, switchboards.
- ☐ wires and sheets.
- ☐ general man cooling.
- ☐ supplying fresh air to storage tanks on tank farms.
- ☐ exhausting welding fumes.
- ☐ stirring up stagnant air wherever men are working or material is drying.
- ☐ drying of walls, sheets etc., after treated with coating material.

NAME.....

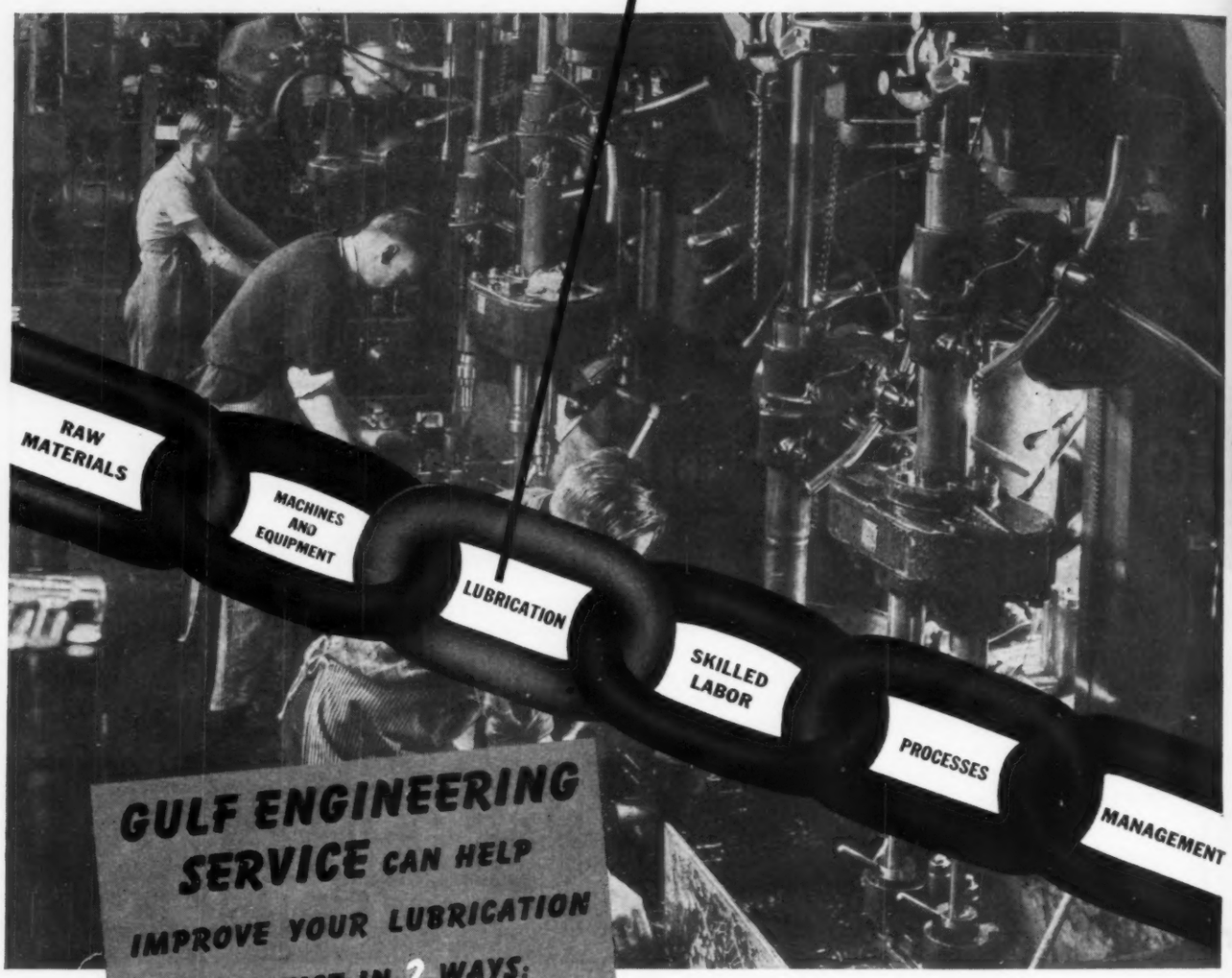
COMPANY.....

ADDRESS.....

CITY.....

(Write below any special ventilating problem you may have.)

Can this important link in your production line be strengthened?



GULF ENGINEERING SERVICE CAN HELP IMPROVE YOUR LUBRICATION PRACTICE IN 2 WAYS:

1 Check all the factors which affect the efficiency of your lubrication

2 Recommend lubricants and application methods which provide better protection for your equipment and improve its performance

WHEN you consider plans to increase output in 1942, don't overlook the importance of lubrication as a link in the production chain. Good lubrication—always a necessity for the satisfactory operation of mechanical equipment—today is a vital requirement for maximum production.

The right lubricants and proper application methods mean the difference between full-capacity operation of machines and below-standard performance. Call in a Gulf engineer now and have him check the lubrication practice in your plant—then follow his recommendations. You can benefit from his thorough technical training and broad practical experience in many plants similar to yours.

GULF INDUSTRIAL LUBRICATION

Gulf quality lubricants are quickly available through more than 1200 warehouses in 30 states from Maine to New Mexico. Write or 'phone your nearest Gulf office today.

GULF OIL CORPORATION · GULF REFINING COMPANY · GULF BLDG., PITTSBURGH, PA.

600 HORSES Flatten San Francisco's Hills!

26 Years of Motor Service . . . With never a Motor Failure! That's the Story of Two Allis-Chalmers 300-Horsepower Motors Operating San Francisco's Historic California Street Cable Car System!

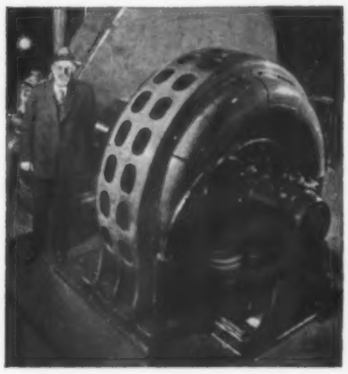
YOU GET a different kind of a street car ride in San Francisco . . .

As part of the picturesque background of this colorful city, cable cars climb hills that would balk ordinary trolley cars . . . grades as sharp as 21%! And down under the tracks are moving continuous cables . . . eleven miles of them . . . kept going at a steady pace of 8½ miles per hour by two Allis-Chalmers 300-hp Lo-Maintenance Motors located at the central station.

No Motor Failures in 26 Years

There's a fascinating story here. Built by Governor Leland Stanford in 1878 . . . destroyed in the earthquake and fire of 1906 . . . the California Street Cable Railroad occupies a unique place in municipal street transportation systems. But that's only part of it —

For the Allis-Chalmers Motors are doing a behind-the-scenes job that is equally interesting to every motor user. Providing power to operate 60,000 feet of underground cable . . . running an average of twenty hours a day . . . there's never been a motor failure with these motors since they were installed 26 years ago! Significantly, it's the same kind of dependable, long-life, low-cost service that Lo-Maintenance Motors have given in thousands of other industrial installations all over the country.



TWO ALLIS-CHALMERS 300-HORSEpower motors keep eleven miles of underground cable in steady motion 20 hours a day to operate the famous California Street cable cars. Shown here with one of the motors is 86-year old James W. Harris who recently retired as president of the company.

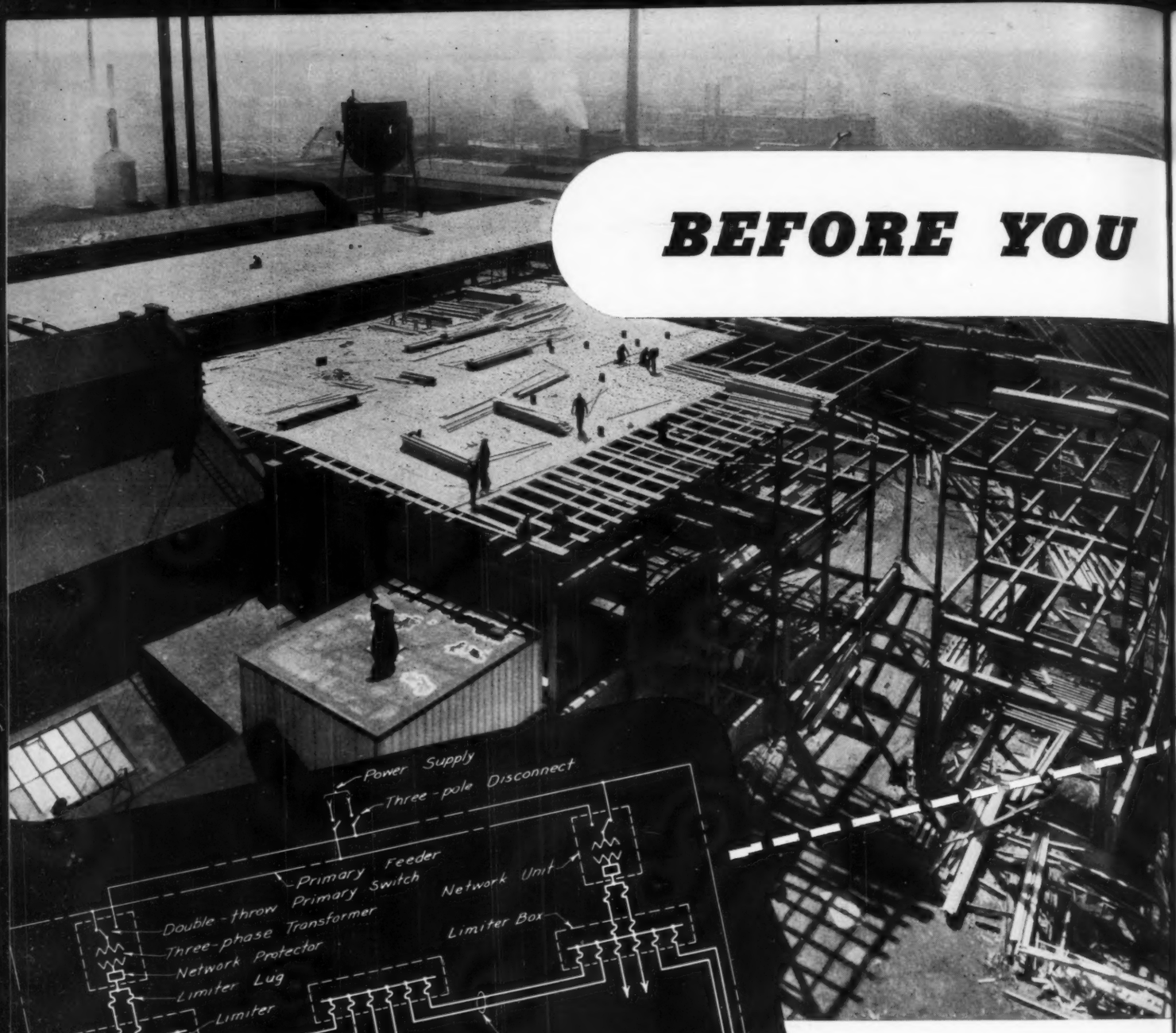
If this is the type of motor performance you want in your plant, get the facts about Lo-Maintenance Motors. The engineer in the district office near you will be glad to give you the information you want. Or you can write Allis-Chalmers, Milwaukee, Wisconsin.

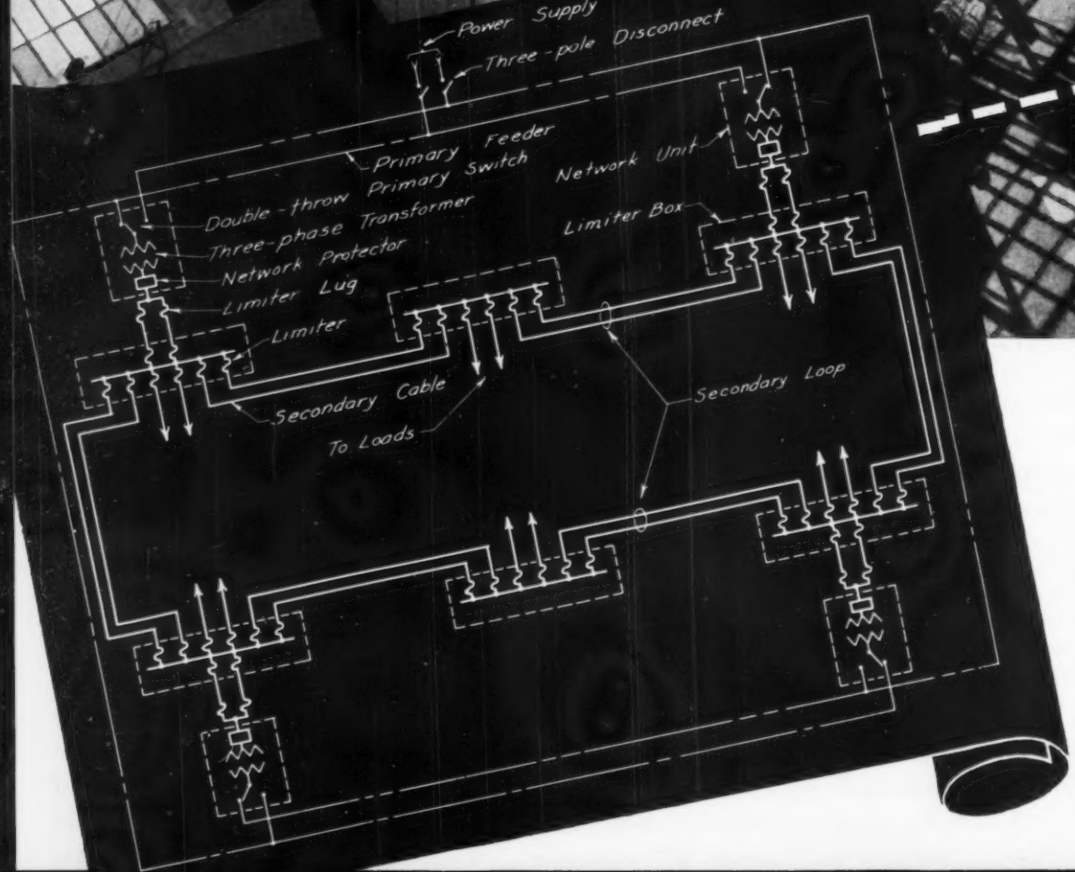
A 1369

ALLIS-CHALMERS LO-MAINTENANCE MOTORS

A COMPLETE LINE FOR EVERY PURPOSE . . . ONE-HALF HORSEPOWER AND UP

BEFORE YOU B





WITH THE NETWORK SYSTEM FAULTY FEEDERS ARE AUTOMATICALLY DISCONNECTED WITHOUT INTERRUPTING SERVICE

By using a double-throw primary switch with each transformer and arranging the primary feeders so that any transformer can be connected to either feeder, spare transformer capacity is held at a minimum. Half of the transformer capacity is normally connected to each feeder. When a transformer or feeder fault occurs, the faulty section is automatically disconnected without interrupting service.

WESTINGHOUSE

Westinghouse

BUILD INVESTIGATE

THESE ADVANTAGES OF THE WESTINGHOUSE PLANT NETWORK SYSTEM

- **Permits load rearrangement or expansion at minimum cost.**
- **Minimizes service interruptions and production delays.**
- **Provides greater protection against sabotage.**
- **Gives better voltage regulation throughout plant.**
- **Cost is comparable to that of other distribution systems now in general use.**

No manufacturer increasing production capacity can afford to overlook the advantages offered by the Westinghouse network system of power distribution.

Under the present conventional radial system employed in most plants, a failure on any main feeder cable results in power interruption to an entire distribution bus. Also, in rearranging machines to facilitate production, one feeder is often overloaded while another is underloaded.

The network system of distribution completely eliminates these difficulties—failure in any primary or secondary cable is automatically isolated without interruption in the power supply. This makes it impossible for a saboteur to cause sufficient damage to the system to shut down the plant and prevents lost production time through accidental faults.

Also, when additional load is added, instead of major revisions in the system, including new transformer banks, the network system can be extended almost indefinitely by simply adding network units. Equally important is the fact that voltage regulation on the entire network will be approximately the same at all points in the system.

This method of power distribution not only serves a new plant's present needs more efficiently but provides complete flexibility for the future at a cost that compares favorably with other systems. Before you build, it will pay you to get complete details on how this method can be used to safeguard production. Write today for folder B-3001.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, EAST PITTSBURGH, PA.

J-94426-A

Time Saver for American Industry

McCaskey Control in use in crib of Harley-Davidson Motor Company, Milwaukee

McCASKEY TOOL CRIB CONTROL *assures...*

MORE PRODUCTION with LESS TOOLS

★ SAVE TIME AT THE TOOL CRIB AND INCREASE PRODUCTIVE TIME

Whether you have one or a dozen tool cribs, McCaskey Tool Control assures big time-savings. By eliminating much of the waiting time ordinarily lost at the crib window, each employee drawing tools is back at the job on his machine quicker, reducing his idle time and that of his machine.

The more men in your shop and the more machines on your production lines, the greater the total saving in man hours and the greater the increase in productive machine hours realized with the McCaskey system. Faster tool service is but one of many practical advantages offered by McCaskey.

The superintendent of a well known plant writes "Under the brass check system we could handle 60 transactions an hour per crib attendant. With the tool requisition system (McCaskey) we can handle as many as 125 per hour."

KEEP TOOLS IN CIRCULATION AND REDUCE TOOL INVENTORIES

McCaskey Control also provides the means for checking in a moment where each tool is—whether in an employee's tool box or at his machine—whether idle or at work—and *how long it has been out.* Employees are easily prevented from hoarding tools that should be in the crib available for use.

Not only is no time wasted locating tools needed for another job, but fewer tools actually are required because *they are constantly available for service.* With increasing delays and difficulties experienced securing new tools today, tool availability is a vitally important factor in meeting production requirements.

From The Chain Belt Company, Milwaukee, Wisconsin—"McCaskey Tool Control gives us complete control of the tools in our cribs. Tools are promptly returned when an operation is completed. The tool inventory has been reduced and breakage eliminated."

• • • •

McCaskey Tool Control can be quickly and easily applied to your particular needs. Both crib attendants and employees like it far better than the antiquated check methods it usually replaces. A McCaskey representative is at your service to analyze your needs and offer practical suggestions.

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

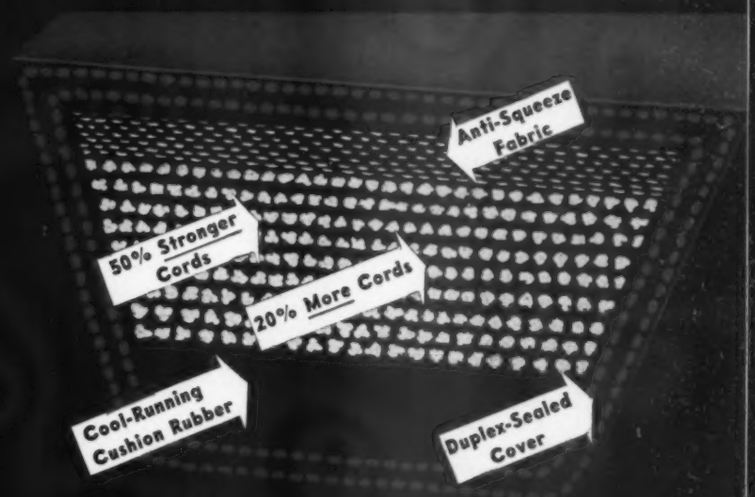
NEWEST V-BELT ON THE MARKET
TEXROPE SUPER-7

1 50% STRONGER CORDS! Sensational new Flexon process makes cords 50% stronger than even those in former great Texrope belts.

2 20% MORE CORDS! Count them! You get 20% more of these tough, extra pulling power cords in every Texrope Super-7.

3 INCREASED LIFE! Cords float on amazing cool-running cushion rubber that absorbs shock . . . actually increases belt life phenomenally.

4 EXTRA PROTECTION! Exclusive duplex-sealed cover protects pulling cords against dirt, grit, moisture, and other adverse elements.



SINCE Allis-Chalmers invented and introduced multiple V-belts sixteen years ago, developments and improvements have been steady... each new type better than the one before... Now, comes the latest and best of them all — the new Allis-Chalmers Texrope* Super-7 V-belt! Without costing any more, it gives you longer life . . . more pulling power . . . greater resistance to stretch. Here's why —

It has 50% stronger cords... 20% more cords . . . and a special new cool-running rubber compound that resists heat . . . absorbs shocks . . . gives years more service. What's more — we wrap the belt in a new "duplex-sealed" two-ply cover that gives extra protection against dirt, moisture, and other adverse elements.

When you order V-belts, get the best . . . *and the best is Texrope Super-7!*

For complete details, call your Texrope dealer or the Allis-Chalmers district office near you. Or write Allis-Chalmers, Milwaukee, Wisconsin.

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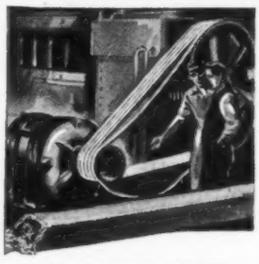
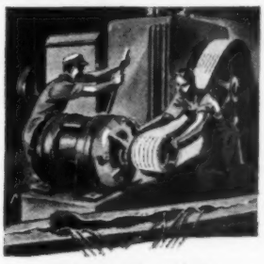


LOOK OUT FOR DANGER
in belts with stiff, unpliable cords! Such belts *look* strong . . . but actually they buckle over sheaves, build up excessive heat that attacks pulling cords. Result: Belt failure far sooner than you expect it.



WARNING SIGN!
Sagging, slipping belts mean too much stretch not backed up by balanced cord strength. Motor must be pulled back often to take up slack. Result: When stretch limit is reached belt breaks under tension.

SUPER-7 TEXROPE BELTS
are made by amazing Flexon process that *combines* flexibility with low stretch . . . great strength. Cords float on cool-running, shock absorbing cushion rubber. Result: *true* strength . . . *true* pulling power . . . *true* endurance.

*Trade mark registered U. S. Patent Office. Texrope Super-7 Belts are the result of the co-operative research and design genius of *two* great companies — Allis-Chalmers and B. F. Goodrich — and are sold exclusively by Allis-Chalmers.

ALLIS-CHALMERS
MILWAUKEE·WISCONSIN

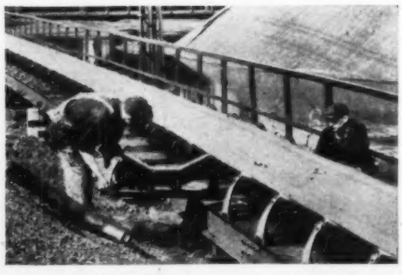
AND I GAVE HIM A NEW SLANT ON AN OLD PROBLEM

① **"WHAT DO YOU MEAN?"** asked this "capacity-conscious" engineer. "How can belt conveyors help me get additional capacity—especially when you know we're already using several conveyors in our plant?"

② **"IN THE FIRST PLACE,** chances are you're not using *belt* conveyors for all they are worth! Remember, they're so low in cost that it's entirely practical for you to install new units and double your conveying capacity!

③ **"AND IN THE SECOND PLACE,** you're not using Rex belt idlers on the conveyors you now have. You're not getting the advantages of Rex's consistently trouble-free, low-cost performance. Shutdowns have been limiting your output!

④ **"REX STEPS UP CAPACITY** by eliminating shutdowns! For instance, Rex's Timken bearings are triple sealed—dust can't get in and hurt the bearings—grease can't get out to rot the belt. No early wear—no "wobble"!



⑤ **"LOOK HOW EASILY YOUR MAN** installs them. Just take out the old—put in the new! If it is ever necessary for you to replace a Rex idler roll, remember that you buy the roll only—because rolls are interchangeable in the same frame."

⑥ **"I GET THE IDEA,"** he said. "Use more belt conveyors and use Rex belt idlers. It sounds sensible, I'll agree. I believe I'll investigate today." . . . He did, and later stepped up his capacity considerably by changing to Rex.

P.S. *Get the whole story on sturdy Rex belt idlers, apron conveyors, and bucket elevators—see how they can step up the capacity of your plant. Send for your copy of Catalog No. 444. Address, 1667 West Bruce Street, Milwaukee, Wisconsin.*

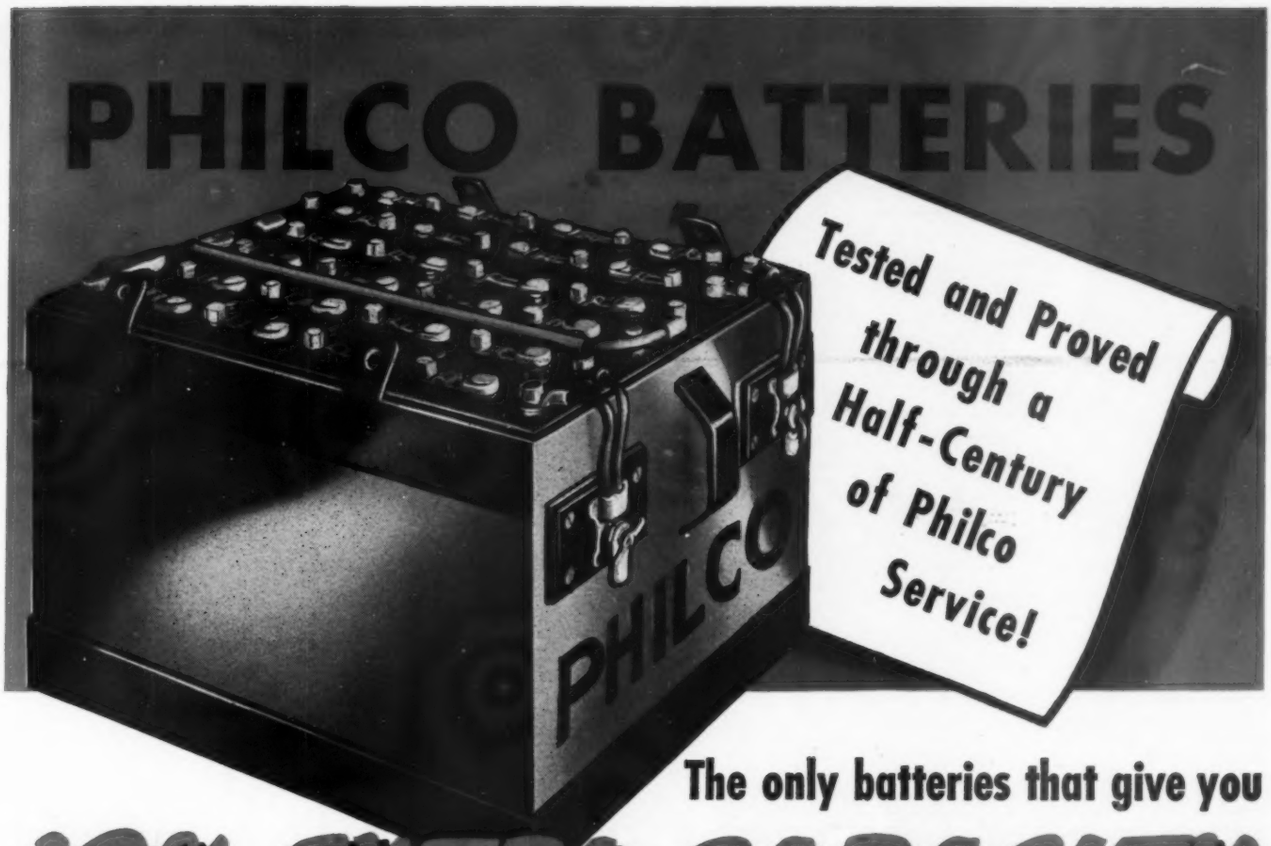
REX CONVEYORS

CHAIN BELT COMPANY OF MILWAUKEE

Baldwin-Duckworth Chain Belt Division, Springfield, Massachusetts • Worcester, Massachusetts
Rex Chain Belt and Conveyor Divisions, Milwaukee, Wisconsin

50th ANNIVERSARY 1891 REX 1941 CHAIN BELT COMPANY

PHILCO BATTERIES



The only batteries that give you

10% EXTRA CAPACITY

in the same compartment space in your electric industrial trucks

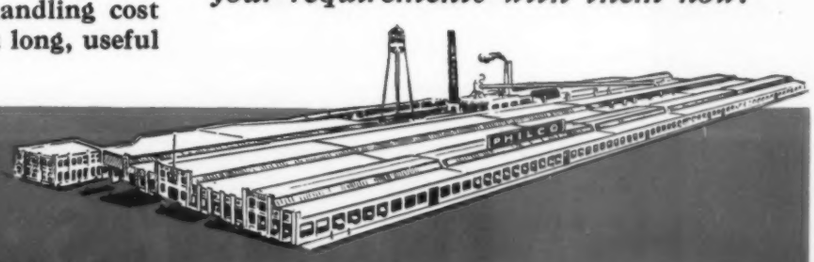
The industrial storage batteries which Philco makes today are the result of the accumulated research, development and experience of fifty years of battery manufacture.

Philco Batteries are the only batteries that give you 10% EXTRA CAPACITY in the same compartment space in your electric industrial trucks . . . ample to do the entire day's work under peak conditions.

They make possible a constant, uniform speed throughout the entire working day. They reduce your material handling cost per truck unit. They offer you long, useful life, with lower charging and maintenance cost . . . and rugged construction to handle tough jobs day in and day out. Philco's Triple Insulation insures dependable, trouble-free performance.

Investigate quality-built Philco Batteries now. They'll do your material handling job the way you want it done!

Philco Engineers will be glad to help you with your battery problem. Check your requirements with them now.



The new plant of the Philco Storage Battery Division with *over 3 times the former production facilities.*

PHILCO

Storage Battery Division

Trenton, New Jersey

FAIRBANKS·MORSE

DIESEL ENGINES PUMPS ELECTRICAL MACHINERY WATER SYSTEMS RAILROAD EQUIPMENT

• *Now* is the time to give your motors a thorough physical examination. Can they be depended upon to stand up under today's greater demands? Find out *before* they fail . . . *before* they cause expensive delays.

Then *compare* your motors with Fairbanks-Morse Motors having the *Copperspun* rotor. These F-M motors set a new standard of performance . . . a standard that's in tune with today's production tempo.

They are unrivaled in ability to stand up under the most severe plugging and reversing service. Why? Because they are the *only* motors having rotors with windings centrifugally cast in one piece of *solid copper.* And the characteristics of copper make it the ideal rotor material. Copper has high electrical and thermal conductivity (twice as good as aluminum), greater strength, and low thermal expansion.

If dependable power is important to your operations, investigate these superior motors now. Write Fairbanks-Morse & Co., Dept. L31, 600 S. Michigan Ave., Chicago, Ill. Branches and service stations throughout the United States and Canada.

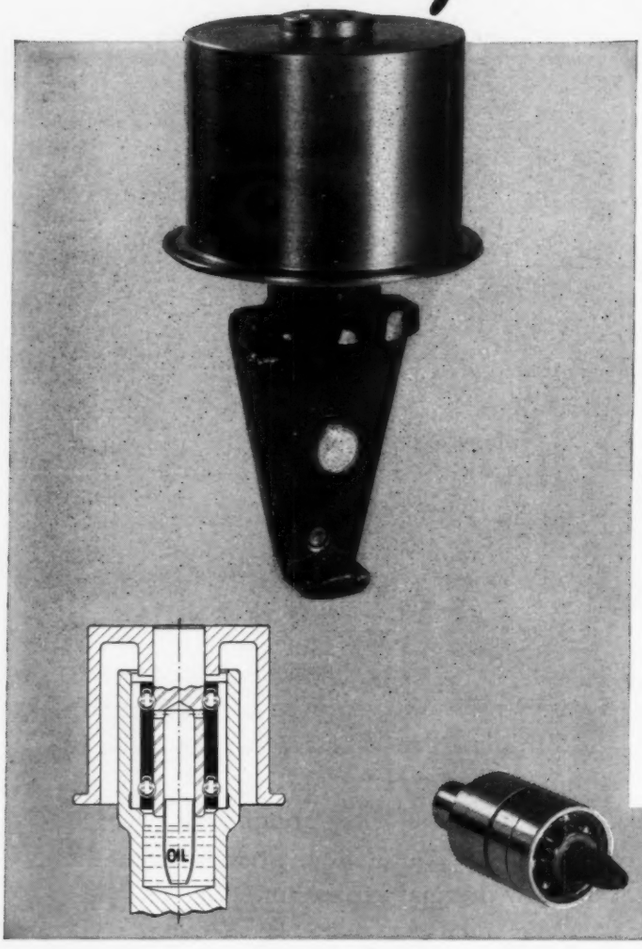
Copperspun

PATENTED

MOTORS ★ ★ ★

SCALES FARM EQUIPMENT WASHERS-IRONERS STOKERS AIR CONDITIONERS

inside it's always *raining*



● Yes, a continuous shower of tiny drops of oil inside this Tension Pulley Ball Bearing keeps balls and raceways automatically lubricated. It is the *first* anti-friction bearing with its own oil-circulating system—a permanent built-in feature, enabling it to run for a year or more without attention.

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Nothing rolls like a ball. Ball bearings are used wherever shafts turn. Ask for your copy of that absorbing, superbly illustrated treatise: "Why Anti-Friction Bearings." New Departure, a division of General Motors, Bristol, Connecticut. Chicago and Detroit.

New Departure

. . THE FORGED STEEL BEARING

FACTORY
MANAGEMENT AND MAINTENANCE
L · C · MORROW · EDITOR

It's Time to Stop the Stoppages

Freezing the closed-shop issue by law seems to be the one action likely to contribute most to straightening out the present labor mess. Then, with the closed shop out as an issue, Congress should provide that no strike could be called except after approval by a majority of the workers affected, with secret balloting conducted under government supervision.

A patient public and a cowed industry have waited while the Administration and its Mediation Board have made concession after concession to organized labor. With what result? Only to have the whole defense program jeopardized in spite of the extraordinarily pro-labor policies and decisions.

How unfortunate for the cause of all labor that strategic parts of organized labor are in the hands of a few leaders fanatically carrying out organization activities and striking to establish the closed shop regardless of the emergency. What a glorious opportunity those same leaders are foregoing. By voluntarily taking and sticking to the stand that they would not attempt to profit by the emergency, they could build up at once an extent of respect and confidence that they will never achieve by means of their present tactics.

But since labor will not do those things for itself, it must have them done for it. Labor, for services rendered, deserves to be well treated by the political party now in power. But the labor I refer to is *all* labor, not merely those parts grouping themselves into unions. And the time has come when labor will be best served by certain restrictions placed by the Congress and approved by the Executive.

Elimination of the closed-shop issue and the calling of strikes by minorities should, in my opinion, constitute those restrictions. They are not drastic steps when considered in the light of the need for industrial peace and continuity in production. They are not steps that will provide permanent peaceful relations because, eventually, there must be adopted a national labor policy that will treat employers, employees, and the public without prejudice. But they are simple, they can be put through quickly by Congress, and they will serve well for the emergency.

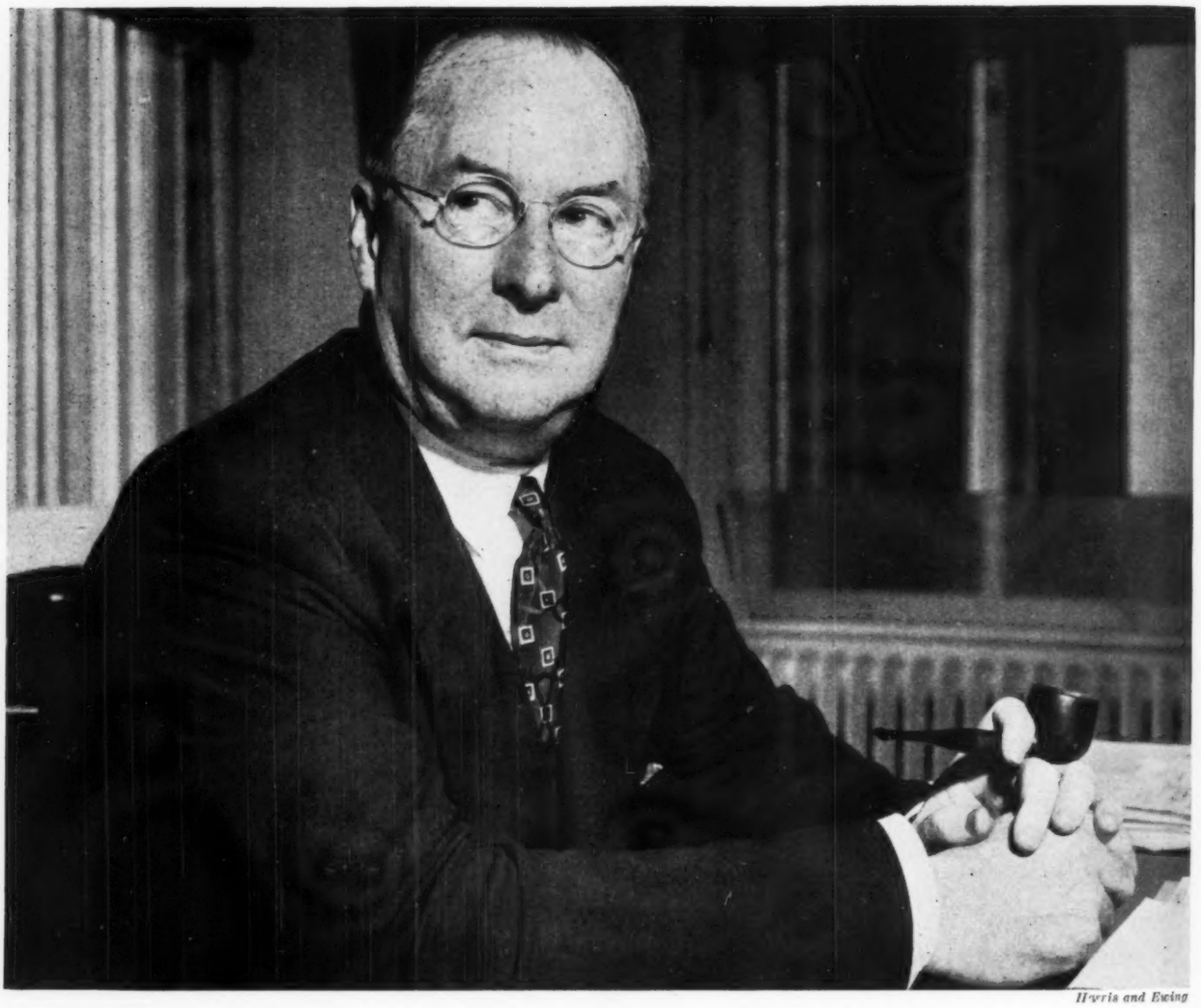
Congress is now showing some signs of intestinal fortitude. God help our defense if its members get to thinking more of labor's votes than they do of national welfare.

L C Morrow

What's Ahead for

By DONALD M. NELSON

SPAB director, in vital personal message to management, predicts industrial awakening to magnitude of job that now is but "dimly understood." No false optimist, he realistically depicts choice that lies before industry



Harris and Ewing

Almost unique among government officials—and among men—Donald M. Nelson is noted for his tendency to do more listening than talking. He hears both sides of a question, puffs his pipe, then delivers a reply that is brief, keen, factual.

Nelson came relatively unheralded to Washington, rose rapidly to the responsible dual posts of Executive Director of the Supply Priorities and Allocations Board (SPAB) and Priorities Director of OPM. To *Factory's* readers he talks a familiar language for, as executive vice-president of Sears, Roebuck, he has had broad contact with industry

Industry—and Why

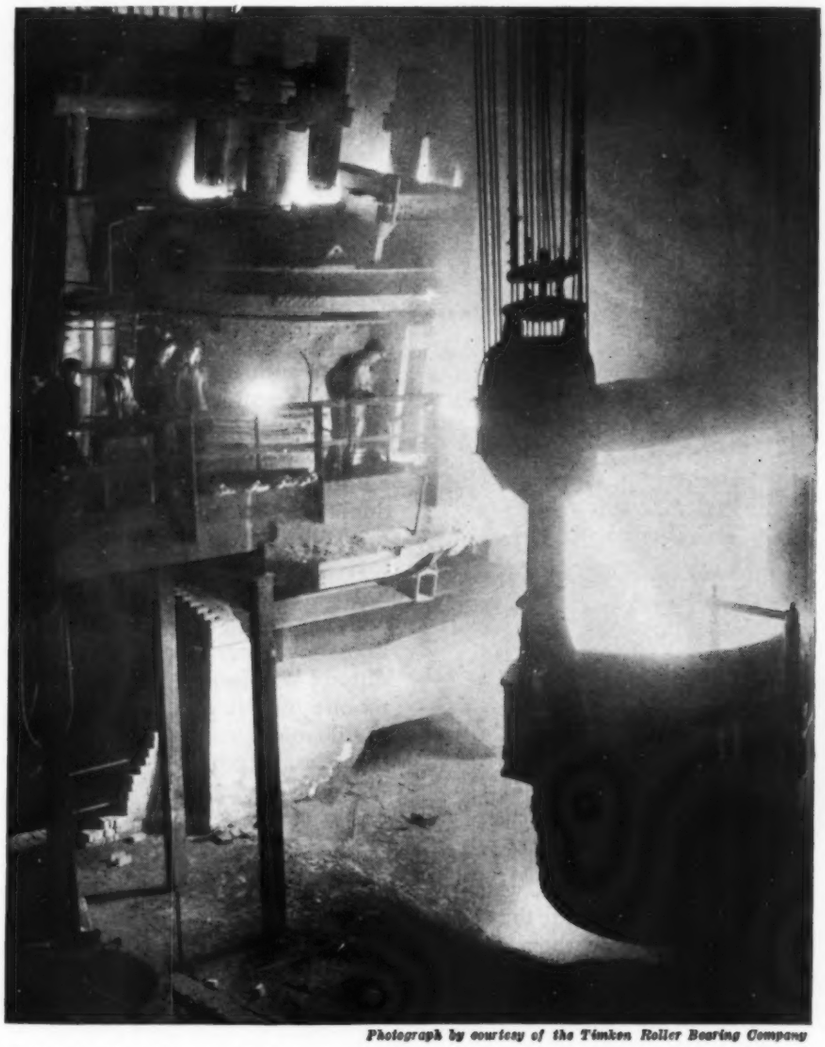
WE, AS A NATION, now stand face to face with the stubborn facts of simple arithmetic. From X quantity of materials subtract enough to beat Hitler. From the balance subtract enough to meet U. S. civilian needs. The balance then remaining, if any, equals the amount that is going to be available for civilian wants.

Any other arrangement of the figures won't do. Any other sequence of procedure may postpone for years or, worse still, *preclude* the achievement of the national objective, which is the defeat of Axis aggression.

Our equation, when applied to what we know of our resources, brings us to this conclusion: There will hardly be enough of anything—metals, chemicals, or other commodities—to go completely around. This means not merely that *somebody* will have to do without, but that *everybody* will have to do without.

Why do I begin by emphasizing what should be one of the most obvious truisms of defense? Because I am convinced that the colossal scope and urgency of the defense task before us, are as yet but dimly understood. My evidence is in the thousands of letters that come to my desk from every corner of the country. They come from perfectly good citizens who want me or their Congressmen to do them some favor that will help them to go on doing business as usual or pretty much as usual.

This does not imply any general tendency to oppose or impede defense. It *does* signify doubt and confusion. People seem still to doubt that materials will be scarce. People seem still to be confused about the necessity for speeding up defense production on a real emergency basis.



Photograph by courtesy of the Timken Roller Bearing Company

"I doubt that there will be available for strictly civilian use next year more than 50 percent of 1941's supply of steel." One of Nelson's rare conversational moods finds him ready and willing to talk, through *Factory*, to plant operating men. This candid, sincere article contains the points he most wants you to understand about the national defense program and your part in it

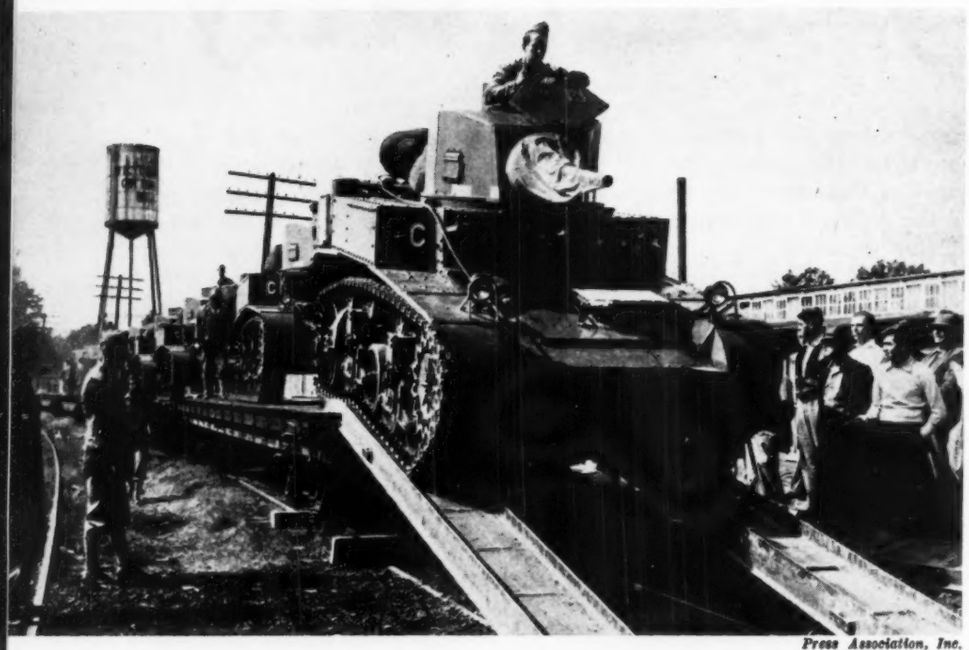
The Size of the Job

This is not wholly surprising. There was among us no prophet, 16 months ago, who could give us even a glimpse of the magnitude of the job ahead. We began with a sort of great, national cocktail party at which we said, sincerely enough but with little realization of its full meaning, "Let's all get together and beat Hitler." This appeared at the time to suggest a defense program of $6 billions, $8 billions, or even $15 billions superimposed on a happily expanded national income—with jobs, goods, and profits for all.

We did not, we could not, foresee that the dollar dimensions of the job would leap from $6 to $60 billions on its way to an even higher total in scarcely more than a year. The real strength of our opponents was not revealed. We could not foresee all that would actually be entailed in the dual tasks of arming ourselves and supporting the nations that stand between us and disaster.

Woodrow Wilson once observed, "It is not an army that we must shape and train for war; it is a na-

DONALD NELSON MAKES THESE PREDICTIONS . . .



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. . . . . GOALS

"Indecision cannot survive the simplest comparisons of the goals which we set up initially and the goals of today. Where once we talked with awe of 2,000 medium tanks a year, we are now calmly preparing to make well over 20,000—and that may be only another low target! Consider, then, that 20,000 light tanks — *light* tanks, mind you—require enough sheet steel to make 2,000,000 household refrigerators—close to a year's output for the industry"

Photograph by courtesy of Chrysler Corporation

. . RESTRICTIONS

"The allocations plan may seem harsh, but it is better than chaos. And it is nothing new. In fact, it was born of our own World War experience; in mid-1918 we ordered automobile production reduced by 75 percent. Today we are still far from touching the bottom in civilian restrictions and I hope we may never do so. We can see what the bottom looks like, however, when we glance abroad to England where automobile output is currently limited to 100 new units per week, and those for export only"

tion." That is so, and it is not only the armies but the whole economies of nations that we must aid in their resistance to the aggression that threatens us all. There are 3.9 British subjects (India included) to every American, 1.5 Russians, 3.5 Chinese. Again arithmetic produces a startling conclusion: You and I as individuals are pledged to the military and economic assistance of 8.9 persons apiece. This is to say nothing of the Dutch East Indies, whom we will help to arm, and the Latin-American nations for whom we must secure economic independence from Nazi domination.

Yet from this position, with all its implications, I cannot believe that we will wish to retreat at the cost of our ultimate economic security, our freedom to sail the seas, and our traditional personal liberty.

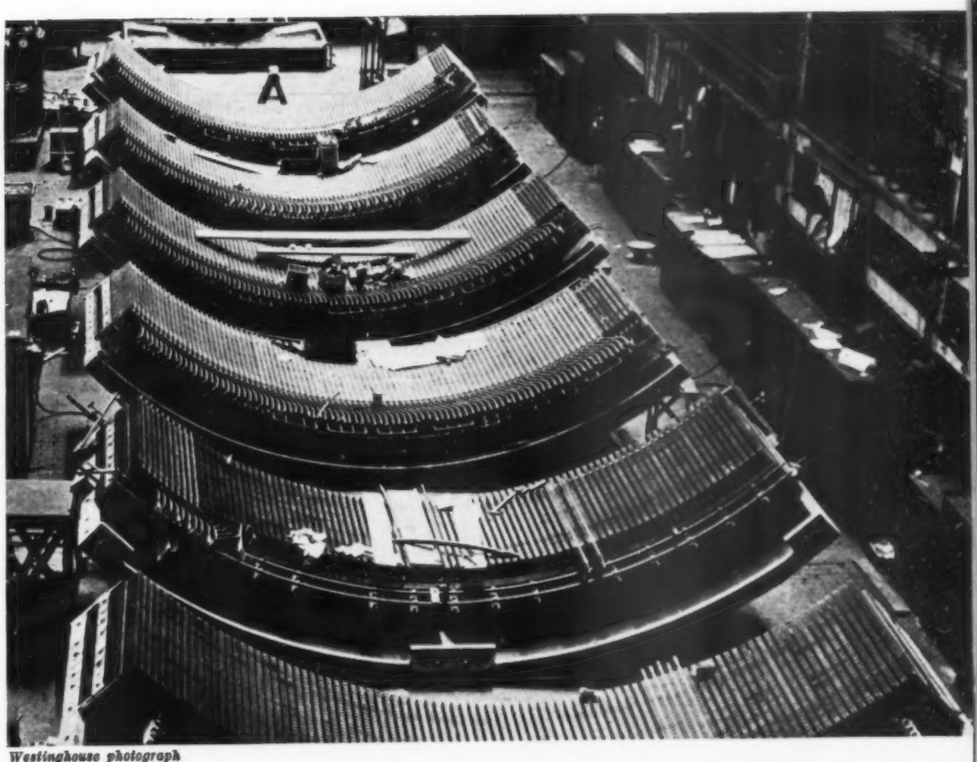
Americans once echoed as one man the challenge, "Millions for defense but not one cent for tribute!" Today our adversaries are no mere handful of Barbary pirates. Opposition to the Axis is a grim matter of *billions* for defense—not simply billions of dollars but billions of man-hours, billions of pounds of production.

We can win, but first we must conquer, within our own borders, doubt, indecision, and complacency.

Doubt disappears as actual defense

. . . SCARCITIES

"Arithmetic tells us that in 1942 our total maximum supply of copper from all sources cannot exceed 1,800,000 tons. From this, on the basis of current production, we must subtract 1,000,000 tons for military needs. From the balance we must subtract at least 400,000 tons for transportation, utilities, and other absolute essentials—just enough to keep our civilian economy going . . . To get the full picture, bear in mind that a civilian supply of 1,500,000 tons would be required to meet all needs and wants, essential and non-essential, for the year. And so it will go with nearly every material you can name"



Westinghouse photograph

. . PRODUCTION

"You may ask, 'Are we not meeting current production schedules?' In general, I believe we are. But I believe we could beat them easily if we could arouse ourselves to a more positive frame of mind.

"For example, the fact that a plant is working two shifts or even three does not necessarily signify all-out production unless the working force on the extra shifts is actually a large one"

Photograph by courtesy of Lockheed Aircraft Corporation

production reveals the true extent of the scarcities over which rival theorists have previously argued to the confusion of all. Doubt yields to the arithmetic of copper, for example. Arithmetic tells us that in 1942 our total maximum supply of copper from all sources cannot exceed 1,800,000 tons. From this, on the basis of current production, we must subtract 1,000,000 tons (I believe it will be much more) for military needs. From the balance we must subtract at least 400,000 tons for transportation, utilities, and other absolute essentials—just enough to keep our civilian economy going. This leaves only a smattering of copper, if any, for doorknobs, gutters, ornamental grilles, and the like. To get the full picture, bear in mind that a civilian supply of 1,500,000 tons would be required to meet all needs and wants, essential and non-essential, for the year. And so it will go, more or less, with nearly every material you can name. As another instance, I doubt that there will be available for strictly civilian use next year more than 50 per cent of 1941's supply of steel.

Indecision cannot survive the simplest comparisons of the goals which we set up initially and the goals of today. Where once we talked with awe of 2,000 medium tanks a year, we are now calmly preparing to make

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well over 20,000—and that may be only another low target! Consider, then, that 20,000 light tanks—*light* tanks, mind you—require enough sheet steel to make 2,000,000 household refrigerators—close to one year's output for the industry. One could multiply such astonishing examples indefinitely. The point is that the only wrong estimates of defense requirements have been *low* estimates.

Complacency becomes untenable when we reflect that, under present schedules, we shall fail to hit a defense production level that costs 25 percent of our national income until the last quarter of 1942. The nations with whom we have ranged ourselves are currently spending 50 percent and more. Moreover, we can take few bows for our actual production, good as it may seem by past standards. It is still not equal to that of the United Kingdom and Canada combined. Yet our population is 2.5 times theirs and our factories have not been bombed.

Stacy May, chief statistician of OPM, has expressed belief that our

"There is much also that the government can do and will do to speed defense output by providing materials, skilled labor, engineering assistance. But initiative, the key factor, must spring from management itself. I am speaking of the sort of initiative displayed by the combined industries of York, Pa., for example, and of the pooling operations of certain groups of companies elsewhere. In short, I define such initiative as the active determination to make more for defense, and in all kinds of manufacturing to make do with what we have, or, if need be, do without." Here, testing an anti-aircraft gun at York Safe & Lock Company

Working example of labor-management cooperation is found in Britain's National Joint Industrial Councils which negotiate wages and conditions of employment in their respective industries, provide machinery for speedy settlement of disputes. On the facing page, a meeting of the NJIC for the home-grown timber industry, formed to deal with wartime problems arising out of reduction of imports and rapid expansion of production

present schedules are not sufficient to insure the defeat of the Axis within the next several years. Thus, unless we actually prefer a long, costly struggle, we shall have to intensify our current efforts to a very high degree. This calls for a new psychological intensity, a great national change of mind on the part of industry, labor, and the public. I do not mean to single out industrial management as the sole object of this comment. On the contrary I believe that labor-management cooperation saved England in her darkest hour while, for lack of it, France fell. But since I am addressing management through FACTORY, I naturally wish to emphasize the points most pertinent to management's thinking.

In all I have said I have striven to give you the background of our philosophy here in Washington, in the hope that you may better understand the things that motivate the policies of the Supply Priorities and Allocations Board and of the Priorities Division of OPM. I am, like you, a business man and I have had a good bit to do with manufacturing. I have no more desire than you have to harass and embarrass industry. But I have had conferred upon me an unparalleled opportunity to become one of the most unpopular men in America. I cannot foresee, within the visible future, the remotest chance that I will do anything that anybody will like. I am not a pessimist, but frankly I do not know how to be cheerful about the outlook for the manufacturer who makes and the consumer who buys things that people want but do not really need.

Remember, however, that drastic restrictions of materials are caused, not by SPAB, but by the shortages themselves; not by priorities but by the war; not by the United States Government, but by Hitler. And ask yourself this: if there were no regulation, no priorities "traffic cop," what would happen? What would be *your* chances of getting materials in an unbridled market where the ratio of supply to demand was, at best, one to three, and where hoarding and speculation went unchecked? We should have, I fear, the maddest kind of chaos. Moreover, the national defense might be crippled beyond belief. This is a costly lesson that we learned in the World War. At that time, before proper controls were established, coal was being delivered to breweries while steel mills were shut down for lack of coal.

The sweeping SPAB order on copper sets the pattern for a good many more such restrictions yet to come. The limitation of civilian supply to minimum maintenance needs will be

British Press Service photograph

"Labor-Management Cooperation Saved England in Her Darkest Hour, While for Lack of It France Fell"—*Nelson*

their objective. The copper order also illuminates the philosophy of the growing use of allocations rather than priorities. In copper we are dealing with a shortage strong enough to reach up and rip existing materials right out of their installations. In such a situation mere priorities orders would become a haze of worthless paper like so many checks drawn against an exhausted bank balance. Not even the supply of military needs would be assured. We therefore adopt the policy of allocations and restrict the operations of industry so that the total of the allocations cannot exceed the total supply. This also eliminates uncertainty which, I believe, has unquestionably affected management morale.

Better Than Chaos

The allocations plan may seem harsh, but it is better than chaos. And it is nothing new. In fact, it was born of our own World War experience; in mid-1918 we ordered automobile production reduced by 75 percent. Today we are still far from touching the bottom in civilian restrictions and I hope we may never do so. We can see what the bottom looks like, however, when we glance abroad to England where automobile output is currently limited to 100 new units per week, and those for export purposes only.

When, as in the case of copper, we make deep incisions on the civilian economy, I believe we are acting in the spirit of a good surgeon. For is it not better to cut decisively than to pinch and slice aimlessly and painfully? However, like the surgeon, we owe it to the patient to make the operation as hygienic as possible which, in this case, means as impartial as possible.

Speculative inventories cannot be allowed to accumulate in warehouses and terminals. We are completing a survey of large existing surpluses in private hands. These we shall scare out of hiding either by buying them at a fair price or, if necessary, by requisitioning them. But since these private surpluses were legitimately acquired, we owe it to their owners, and to industry generally, also to see that the quantity of materials delivered to the armed services does not exceed military needs. Nor can we allow large private buyers to apply economic pressure in the materials market to the disadvantage of smaller competitors. Finally we must prevent violations of priorities and diversion of critically needed defense materials to non-essential civilian uses. In every instance of this kind, we shall invoke our full power to suspend the delivery of any further materials—except for defense orders already under way—to the offenders.

The necessity for such drastic measures will diminish, however, as the tempo of industry speeds up. You may have wondered what I meant when I referred before to a new psychological intensity on management's part. You may ask, "Are we not meeting current production schedules?" In general, I believe we are. But I believe we could *beat* them easily if we could arouse ourselves to a more positive frame of mind.

For example, the fact that a plant is working two shifts or even three does not necessarily signify all-out production *unless* the working force on the extra shifts is actually a large one. I realize that companies which build up personnel and operating costs are entitled to a good-sized backlog of defense business—to "order security" so to speak—and I believe the government will give that security. The mere magnitude of the over-all defense effort, once you really visualize it, is a pretty good guarantee in itself.

How Plants Will Survive

There is much also that the government can do and will do to speed defense output by providing materials, skilled labor, engineering assistance. But initiative, the key factor, must spring from management itself. I am speaking of the sort of initiative displayed by the combined industries of York, Pa., for example, and of the "pooling" operations of certain groups of companies elsewhere. In short, I define such initiative as the active determination to *make more* for defense, and in all kinds of manufacturing to *make do* with what we have, or, if need be, *do without*.

In a mood of greater psychological intensity—and I think it will come—industry will simply not be content with life as it is until Hitler is beaten. Despite curtailments, the aggregate national production will continue to climb. The majority of industries will, through defense work, keep their plants humming.

Every management will ransack the market for existing materials, explore all conceivable possibilities of conservation, substitution, reclamation, and re-design, haunt the subcontracting clinics, and pitch eagerly into the work of local and national defense committees. In a word, *the national will to survive will be coupled unbeatably with the individual will to survive*. And management will submit daily miracles of engineering and operating efficiency and ingenuity in proof of its right to a place in the economic scheme of things.

The Danger of Failure

If our commerce should be swept from the seas and our economy should be permanently cramped within the confines of an economic fence erected by a merciless competitor, there would be little need or opportunity for American management to develop further its brilliant faculty for industrial efficiency. Lowered living standards and permanent, not temporary, economic controls would be the best we could expect—military defeat and the loss of all our liberties the worst.

We can string this job along with half measures for years and years, or we can put on pressure and get it over with quickly. By making it a real emergency we can keep these economic controls of ours on a temporary basis. I believe in a free-enterprise economy and I believe that every day we allow to slide by content with half measures will endanger the ultimate survival of our free economy just that much more.

Americans don't do things by halves. They will never be satisfied, I believe, to play second fiddle in anybody's band. When we all decide to make it the national objective to keep a first position among the nations, we can buckle down and finish the job in half the time and at half the cost of the most conservative estimate that any theorist can put down on paper.

We have done much. We can resolve today to do twice as much and we can do it. When we consider the alternatives before us, I think we will make a national policy of one of the most American of all slogans, "Double or nothing."

NELSON: "Americans Don't Do Things by Halves"

"If our commerce should be swept from the seas and our economy should be permanently cramped within the confines of an economic fence erected by a merciless competitor, there would be little need or opportunity for American management to develop further its brilliant faculty for industrial efficiency. Lowered living standards and permanent, not temporary, economic controls would be the best we could expect —military defeat and the loss of all our liberties the worst. We can string this job along with half measures for years and years, or we can put on pressure and get it over with quickly. By making it a real emergency we can keep these economic controls of ours on a temporary basis. I believe in a free-enterprise economy for this nation of ours, and I believe that every day we allow to slide by content with half measures will endanger the ultimate survival of our free economy just that much more"

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We Got Our Old Plant Ready

Higher costs, bigger taxes, greater demands for new products, unknown defense requirements—this plant saw them coming, initiated a modernization program that has concentrated supervision, cut out excess handling, busted bottlenecks

ALAN C. WALKER, Factory Superintendent, and **W. A. WILLIAMS,** Methods and Development Engineer, The American Pulley Company, Philadelphia

So WE TOOK THE OLD PLANT that was creaking and groaning under the slowly increasing loads of early 1940, and have turned it bit by bit into one that is now producing some 240 percent of the very respectable 1935-39 average! There, in a sentence, is the sum and substance of our rearrangement and relocation of manufacturing, storage, and service facilities.

It took a couple of decades to "get that way," only a couple of years to get out from under. And it hasn't cost much money. Total expenditures for 1940 were $21,000, of which $10,000 was charged to capital investment and $11,000 to current expenses. We'll spend about $40,000 this year.

Has it paid? Listen. Current output of V-belt pulleys is up three times from the 1935-39 average. Likewise miscellaneous power-transmission products, including high-torque-motor pulleys, motor bases, speed reduction units, collars, and hangers. Pressed metal stampings—such things as reels, spools, windshields (the front ends of naval shells), and bomb parts—have increased more than three times. Incoming business on hand trucks for August was up five times, while August output was up three, and could have been higher if steel and bearing shortages had not held us up. Even that old reliable, the flat-belt pulley on which our business was founded, is up 40 percent over the 1935-39 figure and has found a new, if more modest place, in the sun!

We saw it coming. Over a year ago, new peak demands for several products were forceful reminders of the change in the character of our business and of the increase in volume of new products. Most of these were started on a small scale in shop location wherever the initial operations could be handled to best advantage.

Take hand trucks. It seemed logical to assemble them on a balcony over the pressroom. Too bad the wheels had to be stored some 350 feet away in another building! Too bad the shipping department was so far off! But while volume was small, it didn't seem to matter much.

And so with practically all the other new products we were developing. As the depression waned, they outgrew their locations, and in our efforts to replace the reduced income from flat pulleys by increased profits from these other products we began to study (1) the flow of materials through the factory; (2) the facilities and expenses for supervision, materials handling, and other non-productive labor; and (3) location of our stocks of materials, parts, and dies.

This study located opportunities to correct bottlenecks and excess handling, to concentrate supervision, and to attain generally a higher degree of effective use of production facilities and organization.

We were, in short, faced with the prospect of higher costs for labor and materials, higher taxes, a still greater volume of the newer products, and unknown demands upon our facilities in the interest of the defense program. It was not too difficult, therefore, to sell our board of directors on the idea of a complete overhaul, to be carried out as quickly as the various

Authors on location. Alan C. Walker, left, discusses the next job on the list with W. A. Williams. The latter was graduated from University of Washington in 1934, took his master's degree in mechanical engineering at MIT. With York Ice, then Westinghouse. Came to American Pulley 2½ years ago. Alan C. Walker is a graduate of Central Manual Training School, Philadelphia, and of Spring Garden Institute. Attended University of Pennsylvania night school, served his apprenticeship as a toolmaker and was draftsman for two years with Hale & Kilborne Company. Then became chief draftsman of the U. S. Metallic Packing Company. With American Pulley since 1906

to Carry a Load for Defense

Freight cars were formerly unloaded by hand. Cost, 40¢ a ton. Siding has been relocated. Cars can now be spotted under the cab crane. Special sheet lifter makes pick-up and put-down a safer, faster job. With steel spacers more steel can be stored per pile. New cost, less than half the old

moves could be intelligently planned and smoothly executed—without, naturally, interfering with current production.

We actually got underway in mid-1940, have been at it ever since. The job is not finished, but we are beginning to see daylight—literally in more than one phase of the program.

It would be difficult to tell the story in chronological order, because it has not been possible to start a single project, work on it, finish it, and then start another. It has been more on the order of a three-ringed circus, with a number of overlapping pieces of the program being carried on concurrently. It might be better, therefore, to start with the receipt of raw materials and peg our description roughly on the flow of those materials through the plant.

First a list of things we have done:

1. Installed new railroad siding for incoming steel, our principal raw material.

2. Extended and improved steel-handling equipment.

3. Rearranged pressroom, relocating and increasing die storage.

4. Re-equipped pickling room.

5. Relocated truck assembly.

6. Set up new departments for window and speed-reducer assemblies.

7. Consolidated machine shops.

8. Moved and consolidated parts and supplies storerooms, and installed a modern cafeteria.

9. Centralized factory executive and engineering activities in one building.

10. Decentralized factory toilets, locker rooms, and washrooms.

11. Improved truck receiving and shipping facilities.

12. Installed new lighting, painted as program progressed.

13. Installed unit heaters.

14. Repaired or relaid floors.

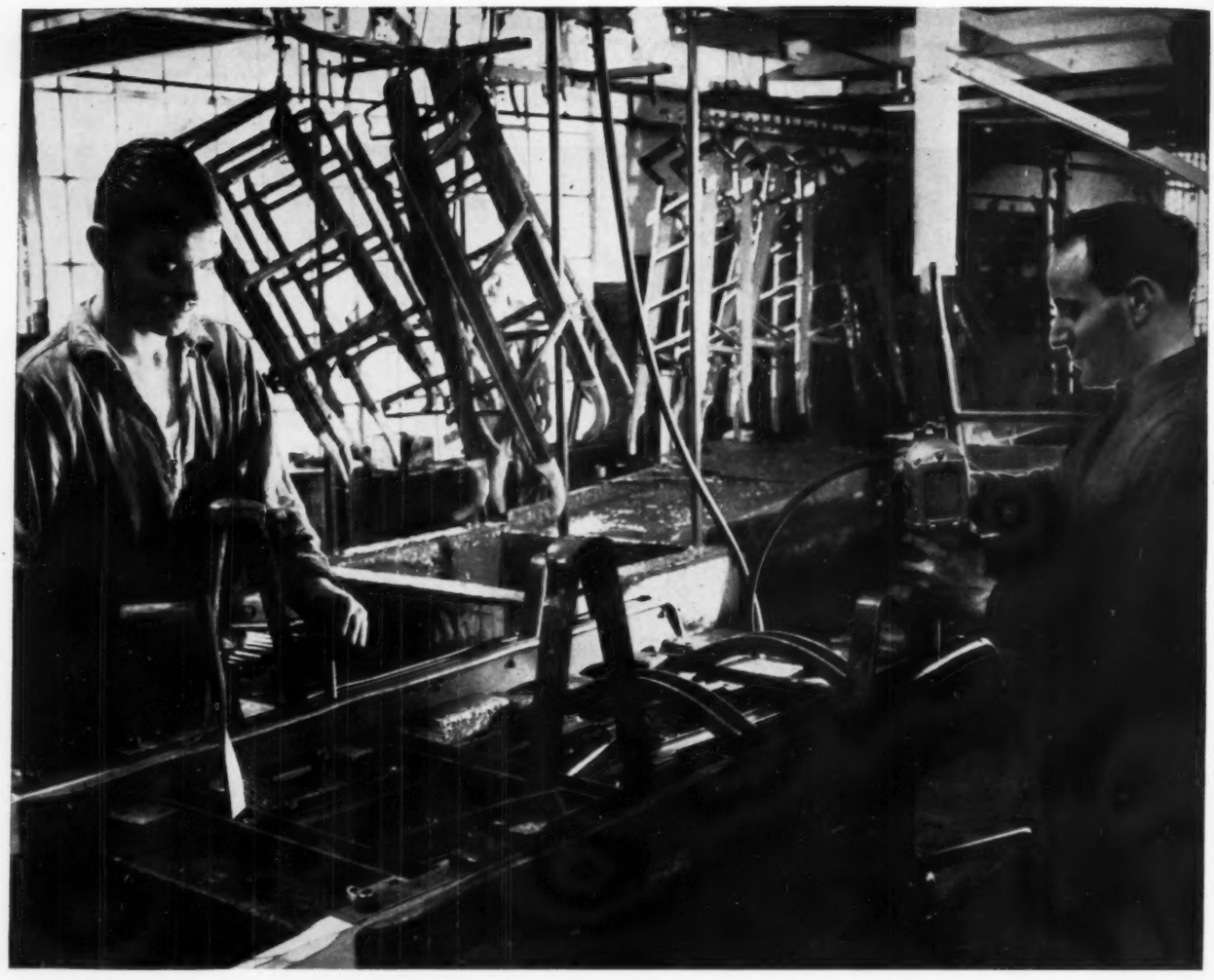
15. Added handling equipment.

16. Enlarged factory gates, installed woven-wire fence.

Detailed descriptions of each item will help the reader get a better picture of the complete program.

1. Railroad Siding

Steel is our principal raw material. We use several thousand tons annually. For 40 years we had been



By laying a second floor in the finished-goods warehouse, American Pulley made room for assembling its fast-growing line of trucks. For $27,000 it got 14,000 square feet of production floor. Truck assembly formerly straddled and strangled the pressroom. Parts are now located right on the line. Wheels are stored between line and frame storage, not a couple of hundred feet away. Department takes up no more room than it used to, can turn out several times as many trucks at lower unit cost

running a car in on an upper-level siding, unloading by hand, and moving the steel by crane to storage—a slow and costly process, often causing high demurrage charges.

Right under our noses was an abandoned siding that belonged to the railroad. All we had to do was relocate and extend it slightly. Now a car can be moved in at floor level and spotted under the crane, which walks away with the load. No demurrage. Siding accommodates four cars. Car puller makes all moves. Old cost, 40c a ton. New, less than half.

2. Steel Handling

Installation of a U-track enables the cab crane to cover the entire storage area. The crane hoist is equipped with special sheet lifters which make pick-up and put-down a quicker, safer job. Steel spacers have replaced the old wood blocks used to separate the bundles of sheets. Spaces have thereby been decreased, and more steel can be stored per pile. So, quicker handling from car to storage or from storage to process, and more storage capacity in exactly the same space.

3. Pressroom

Took down the gallery on which hand trucks were being assembled, using the timber, incidentally, to erect storage sheds that will keep parts in process out of the rain. This gallery was only 9 feet high. The space under it was black as pitch. There were columns every few feet. The area was about half utilized for die storage.

Presses have now been rearranged to secure a minimum of handling and rehandling, with blanking presses in one row next to the steelpiles. Wide aisles between rows of presses allow plenty of room for temporary storage; it sometimes used to be necessary to move work-in-process way the hell-and-gone out in the yard and back again.

Some automatic screw machines and a small-die machining shop, which did not belong in the pressroom, were moved out to make room for a dozen presses which did—but which had long been set up in another building.

At the same time die storage was rearranged to get dies as close to presses as possible. It was often necessary to go half a block to get a die. Racks were built to provide double- and triple-deck storage, with a rubber-tired die truck acting both as elevator and carrier.

Pressroom offices were consolidated into one, centrally located. The room

used to be divided into two parts—light pressroom and heavy pressroom. This meant two offices, two foremen, a lot of running back and forth, and unnecessary paperwork. Now, one soundproof office, one foreman, one production control center, none of the former confusion.

Power transmission has been modernized. Each bay is powered by a main lineshaft, each with an individual motor. Groups are smaller. Instead of two motors in the pressroom, there are now five. Some machines in the plant are unit driven, this method being used wherever it is found to be more economical than group drive. Anti-friction bearings on all new lineshafts, also some clutch pulleys instead of countershafts.

4. Pickling

Concrete tanks have replaced the old wooden tubs, which lasted only a couple of years or less. A slow hydraulic hoist was abandoned, a fast electric hoist installed. Bronze crates were designed and built specially to handle the materials to be pickled, thus increasing the volume per load.

At the same time we instituted a program of controlling temperature, pickling time, and acid concentration. Reduced pickling time from 20 minutes—just an old-fashioned custom—to anywhere from 6 to 10 minutes, depending on the type of job. Cut down on steam. Saved acid. Decreased amount of vapor. Made the room a better place to work in.

5. Truck Assembly

Made room for this department by installing a second floor in the finished products warehouse, which had a high lantern roof, hence plenty of room for the added floor. First floor and basement are still used for storage, and storage area has had not been reduced. We simply reclaimed space that was absolutely going to waste. A new lighting job made the first-floor storage area as good as ever.

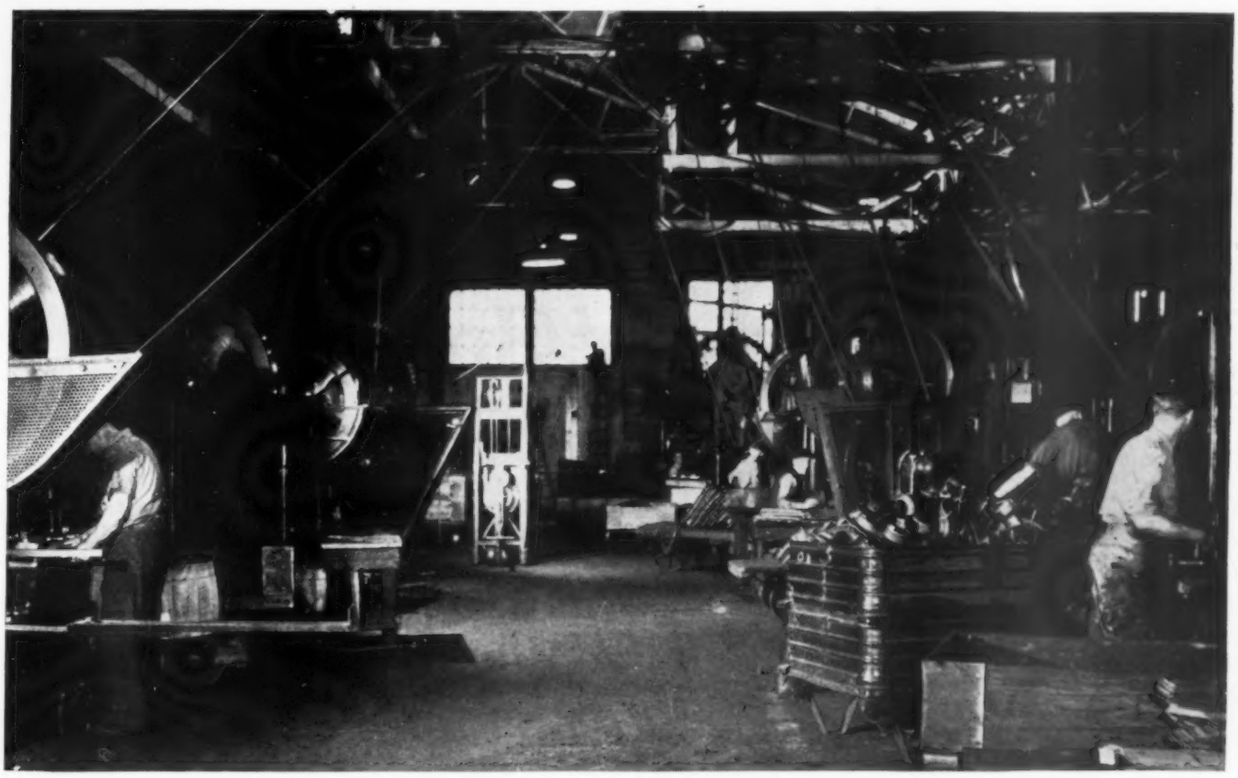
For $27,000 we got 14,000 square feet of space, together with monorail and dipping equipment. This room is laid out for expeditious handling, assembly, painting, drying, and storage. Trucks are assembled, transferred via monorail to the dip tank, moved immediately to monorail sidings where they drip and dry. Wheels are then assembled if the kind of wheel is known; if not, truck frames without wheels are moved by monorail to nearby storage until called for.

This is the department, remember, that formerly straddled and strangled the pressroom. It is now located in space acquired by utilizing "air rights." It actually occupies about the same amount of space it used to take. It can turn out several times as many hand trucks at lower unit cost Parts for each type of truck are now stored together, right beside the assembly area. The dipping tank is on the conveyor line, not somewhere off in another building. And wheels are stored right between assembly line and frame storage, not a couple of hundred feet away.

6. Windows, Speed Reducers

New products, these, within the year. The old practice was to start making a new product in any factory location that seemed handy. Instead,

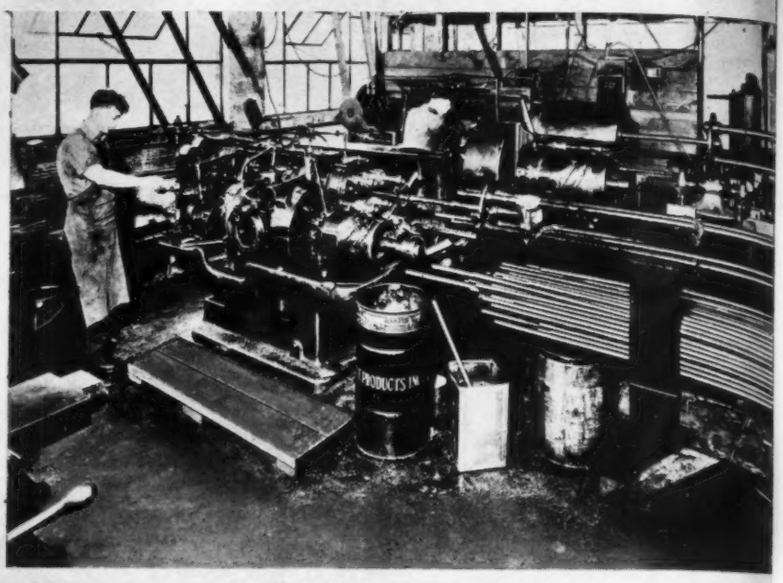
(*Continued on page 160*)



Pressroom is now laid out for minimum handling and flow production. No longer is it necessary to walk half a block for a die. Machines that didn't belong in the room were moved out; presses that did were moved in. Balcony, where trucks used to be assembled, was torn down. Wide aisles provide plenty of temporary storage space. Formerly two pressroom offices, two foremen, a lot of running back and forth, much needless paperwork. Now one office, one foreman, no confusion

Machine tools

The following machines are ready for defense production work:



SCREW MACHINES—AUTOMATIC

Gridley . . . 4 Spindle—1¾" diameter maximum
Gridley . . . 4 Spindle— ¾" diameter maximum

SCREW MACHINES—HAND

Warner & Swasey No. 2—1" diameter spindle
B & O . . . 1½" diameter spindle—16" swing
Foster . . . 2" spindle—16" swing
Foster . . . 2¼" spindle—18" swing
Foster . . . 2" spindle—16" swing (Power turret & slide)

LATHES—ENGINE

American	24 x 96	South Bend	16 x 84	Monarch	24 x 72
American	18 x 50	Bradford Mill	20 x 96	National	18 x 81
American	14 x 36	American	16 x 48	South Bend	9 x 36
Monarch	16 x 60	Monarch	16 x 60	Davis	18 x 30
South Bend	9 x 18	Lehmann	20 x 72		

MILLING PLANERS

Kempsmith . . 12 x 54 Table
Van Norman . 9¾ x 44 Table
LeBlond . . No. 2½
Cincinnati . . No. 3—Vertical Attachment
Becker . . . No. 5—Plain
Becker . . . Horizontal—10 x 30 Table
Burke . . . No. 4—Vertical

PLANERS

Gray . . 21 x 72
Cincinnati . 36 x 84
Cincinnati . 24 x 72

SHAPERS

American . . 16" Stroke, 20" Traverse, 10" Vise Capacity
American . . . 20" Stroke, 22" Traverse, 12" Vise Capacity
Ohio (2)* . . 20" Stroke, Heavy Duty
Ohio . . . 16" Stroke
Rockford . . 24" Stroke
Barker . . . 18" Stroke
Davis . . . 14" Stroke

* This notation will appear throughout the booklet signifying the number of machines available of one particular type.

Pair of pages from a booklet prepared by Swartzbaugh Manufacturing Company and Associates of Toledo

How a Group of Small Plants

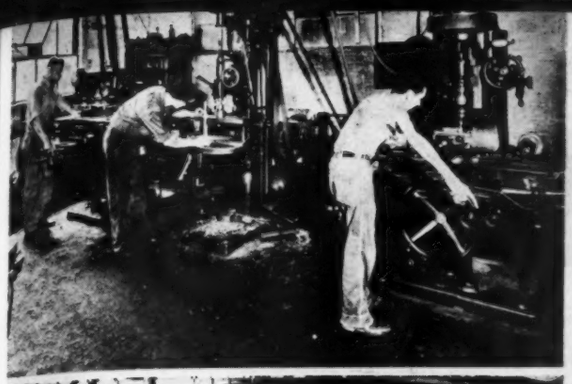
ANY GROUP of small manufacturing plants can use the technique developed by a group of Toledo industries to publicize their ability to handle defense contracts or subcontracts.

Credit for the plan goes to Charles E. Swartzbaugh, president, Swartzbaugh Manufacturing Company (domestic electric cooking appliances and portable food carts for hospitals and factories). Through his efforts seven relatively small plants without defense work were combined into a loosely knit cooperative group which could handle direct or subcontracted orders that no one of them could handle alone.

Cooperating companies, in addition to Mr. Swartzbaugh's own concern, are Meilink Steel Safe Company, Schindler Stamping & Toy Company, Associated Designers, A. Netter & Sons, Inc., DiSalle Plating Company, Inc., and Toledo Metal Spinning Company. All are metal-working plants accustomed to working with aluminum, steel, stainless steel, copper, brass, tin plate. Location, Toledo. Number of buildings, 10 (3 with railroad sidings, others close to railroads). Total floor space, 230,000 square feet. Total skilled and unskilled employees, 450.

One more example, obviously, of the pooling of industrial resources hailed by Floyd B. Odlum in November FACTORY (page 50) as one of the three major approaches of OPM's Division of Contract Distribution to the current problem of spreading defense contracts. However, the Swartzbaugh plan does not stop with the organization of what industry has come to know as a "mother-hen" unit. It goes on from there to tell the world—meaning those who ought to know—just how well the group is fitted to undertake government work.

The telling is done in a booklet which has been sent to selected lists of procurement officials, Chambers of Commerce, and large prime contractors in strategically located cities. The booklet (8½x11 inches) contains sixteen pages well illustrated by exterior and interior photographs of the cooperating plants, and is attractively printed in two colors. Names of com-

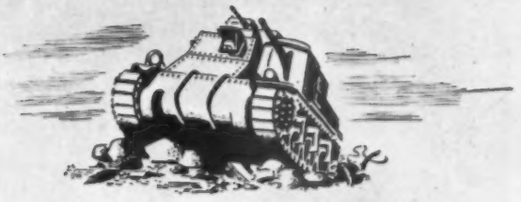


GRINDERS, FILING AND SANDING MACHINES

Welmarth & Norman	10½ x 20 Automatic
—	8 x 32 Hand Roughing
Diamond	6 x 24 Surface
Thompson	8 x 48 Tool room type with attachments
Cincinnati	— Tool room type with attachments
LaSalle	8 x 14 Surface—Swivel Table
Oliver	32 x 96 Belt Sander
—	Portable Polishing Jack
— (3)	Bench Grinder
—	Flexible Shaft Hand Grinder
Do-All	Band Saw & Filer
Cochrane-Bly	Filing machine
Oliver	Filing machine

DRILL PRESSES

Barnes	Single Spindle—⅞ drill maximum
Canedy-Otto	Single Spindle—½ drill maximum
Excelsior	Single Spindle—½ drill maximum
Rockford	Single Spindle—½ drill maximum
Rockford	Single Spindle—½ drill maximum
Sipp (2)	Single Spindle—No. 1 Taper
— (10)	Single Spindle—No. 3 Taper
—	Single Spindle—No. 3 Taper
—	Single Spindle—No. 2 Taper Radial
Cincinnati	Single Spindle—26" Sliding Head
Rockford	Single Spindle—20" Table
Barnes	Single Spindle—20" Back Drill & Taper
Beckford	Single Spindle—60" Radial
Atlas	Single Spindle—14" Bench Type
Atlas	Single Spindle—12" Bench Type
Demco	Single Spindle—20" Table
Barnes	Single Spindle—16" Table
Delta	Single Spindle—14" Table



. . . illustrate a technique that may readily be used by other industry groups to solicit defense contracts

Went After Defense Orders

panies in the unit are listed on the inside cover, following a statement of aims which concludes with the very frank admission: "We solicit inquiries for defense work."

Subsequent pages describe the more important facilities offered for defense production. Listings are not by plants (see "We Can Do Defense Work," November FACTORY, page 60), but by production facilities and types of equipment—as follows: (1) Machine and tool design; (2) machine tools; (3) deep drawing; (4) welding; (5) press brakes; (6) heavy stampings; (7) light stampings; (8) plating, buffing, and polishing; (9) painting and finishing; (10) sheet metal working; (11) spinning. Shown above, to indicate how the booklet is laid out, is the machine tools exhibit, a pair of facing pages on which are listed machines ready for defense work.

It cannot be recorded here that the publicizing of this information has resulted in an avalanche of orders. The awarding of defense contracts is not as simple as that, and apparently the OPM mill grinds slowly. But even if no defense orders have been immediately forthcoming, one direct outcome has been the formation within the past few weeks of the Toledo Committee for Defense Work, with Mr. Swartzbaugh as chairman, and with Toledo industrialists and labor leaders as members. A plan has been worked out for pooling all the city's industrial facilities; the committee will bid on defense orders, then farm them out to Toledo plants. Such plans have worked in towns like York, Pa., but have never before been tried in a big industrial city.

At any rate the plan has the Army's and OPM's blessing. The committee has to date bid on one order and lost, appears at the time of writing to be in a fair way to get an order for 600,000 to 800,000 4-lb. incendiary bombs. Similar action by other Toledos will help break down any remaining resistance to the principle of subcontracting, bring aid to thousands of small plants, play a substantial role in shifting the national defense program into high gear.

Trucks and Pallets Bring Handling Costs to Earth

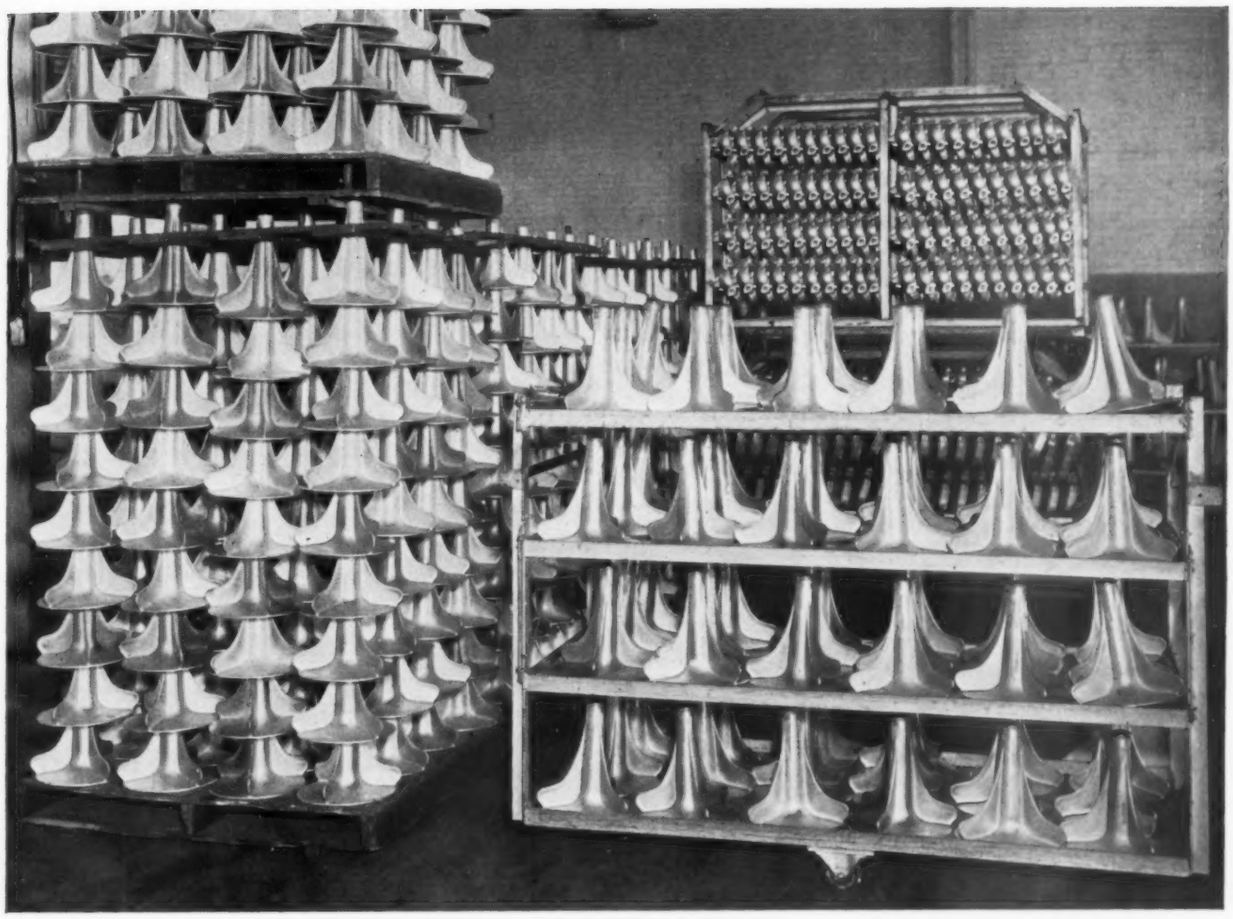
Handling incoming and outgoing material in unit loads on pallets shows substantial savings in packing costs, packing materials, and disposal of packing materials

C. H. BARKER, JR., Supervisor of Production, General Electric Company, Bridgeport

WHEN IT WAS DECIDED that an extended use of fork trucks and pallets had a definite place in our materials handling picture, groups ranging from top management to planners and stockroom foremen were shown representative materials from all sections, arranged in various types of unit loads on either single or double-faced pallets. By seeing a fork truck handle, transport, and tier all loads that we might conceivably encounter, these groups could visualize handling the materials with which they were directly concerned.

Because incoming materials appeared to be the most fertile field, that's where we started to work. The first step was to review all incoming materials, and classify the ones in whose handling methods appeared room for improvement. The next step was to break down invoices between productive material cost and packing cost. We did not permit packing cost of the unit load to exceed the former packing cost, so that all reductions in materials handling costs would be actual savings. The result was that in many instances we made substantial savings in packing costs and in addition materially reduced the cost of disposing of the packing materials.

UNIT LOAD PACK of 100 fractional-horsepower motors is used for shipping motors to works and warehouses of our company, and to volume industrial users. Where customers are not equipped for pallet handling, the base is a skid with long plywood legs to permit the entry of a platform truck. Originally these motors were packed in individual wooden boxes. The first palletized unit load of 64 motors was considerably heavier, bulkier, and more costly, than the present one.



UNIT LOADS OF ACTIVATORS as received from the vendor are shown above at the left. Short pipe standards screwed to the pallet serve as pedestals. After the pallet is loaded, a long piece of pipe, slightly larger in diameter, is run down through the center hole of the activators and outside the short pipe standard of each of the four corner piles. This provides rigidity to the piles of activators. The top holds the various piles in place, and enables the tiering of unit loads. The tilting truck at the right, with shelves under spring tension while in a horizontal position, is used for feeding activators to the assembly line. In the center background are tiered portable racks of gearcases.

VARIOUS SIZES OF SPOOLS of fine wire are being received in substantial unit loads. The pack minimizes handling empty spools, with a dunnage weight considerably below that prevalent under former practices. Where fork trucks are the major medium of transportation it is naturally essential that all auxiliary equipment be built around fork trucks wherever practical.

(Continued on next page)

A HEAVY, COMPACT LOAD of small transformers after they have been removed from the freight car by the fork truck. Like the motors, these transformers were formerly packed in corrugated cartons. Manufacturers of corrugated boxes have not been discouraged, however, because corrugated boxes are now being employed where wooden boxes were formerly used—for example, stainless steel sheets, porcelain, and plastic parts.

NEWLY PURCHASED PALLETS were delivered to a nearby supplier of corrugated boxes so that boxes could be delivered in unit loads. Forty such units make up the complete carload. Since this was done, many shipments have been made on lighter, less expensive single trip pallets. If new pallets are not required for factory use, naturally the single trip pallet proves more economical. As a rule, pack is necessarily returnable when utilized for heavy materials, non-returnable pack is used for lighter materials.

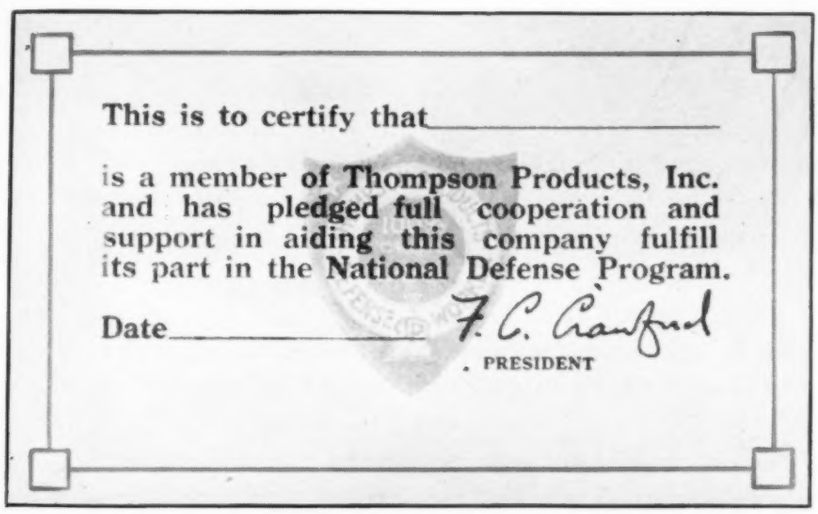
"Let's Go!" Say Cleveland Defense Workers

Lapel emblems, posters, honor rolls, all means whereby the importance of their defense work is brought home to factory workers

WHEN MEN ARE DOING a special job, recognition of its importance gives them added incentive. And when that job is directly connected with national defense, an emblem that shows they are doing their part not only encourages them, but also stirs the latent patriotism of their fellow-workers.

In one of the Thompson Products, Inc., Cleveland plants, a group of men who were thus working on defense contracts decided to form a "Defense Workers Club." A lapel insignia was designed, as well as a windshield sticker, and a loyalty pledge was drawn up, to be signed by each worker who joined the club. There were to be no officers, no dues, no membership or initiation fees.

Badges of men actively in service are placed on bulletin board at Cleveland Graphite Bronze


This is to certify that_____
is a member of Thompson Products, Inc. and has pledged full cooperation and support in aiding this company fulfill its part in the National Defense Program.
Date_____
F. C. Crawford
PRESIDENT

Thompson Products employees who sign pledge of "unreserved cooperation" receive certificate, lapel button, windshield sticker

An axle-testing mechanic at Eaton Manufacturing Company does his part by designing patriotic and safety posters

As the idea spread, representatives of two employee organizations, The Automotive and Aircraft Alliance and the Old Guard (a group of employees who have been in the company service for many years), called on President Frederick C. Crawford, and outlined their plans. He and his associates were enthusiastic, and immediately ordered 8,000 emblems and stickers to be given to members. Also, upon signing the pledge, which promises "unreserved and full cooperation and support toward aiding Thompson Products, Inc., to perform its part in the National Defense Program," the club member receives a certificate signed by Mr. Crawford, to identify him as a worker who has given his pledge of loyalty. The certificate is

(*Continued on page 166*)

Ten Commandments
OF GOOD ORGANIZATION

There are two kinds of efficiency: one kind is only apparent and is produced in organizations through the exercise of mere discipline. This is but a simulation of the second, or true, efficiency which springs, as Woodrow Wilson said, from "the spontaneous cooperation of a free people." If you are a manager, no matter how great or small your responsibility, it is your job, in the final analysis, to create and develop this voluntary cooperation among the people whom you supervise. For, no matter how powerful a combination of money, machines and materials a company may have, this is a dead and sterile thing without a team of willing, thinking and articulate people to guide it.

1 **Definite and clean-cut responsibilities should be assigned to each executive.**

2 **Responsibility should always be coupled with corresponding authority.**

3 **No change should be made in the scope or responsibilities of a position without a definite understanding to that effect on the part of all persons concerned.**

4 **No executive or employee, occupying a single position in the organization, should be subject to definite orders from more than one source.**

5 **Orders should never be given to subordinates over the head of a responsible executive. Rather than do this the officer in question should be supplanted.**

6 **Criticisms of subordinates should, whenever possible, be made privately, and in no case should a subordinate be criticized in the presence of executives or employees of equal or lower rank.**

7 **No dispute or difference between executives or employees as to authority or responsibilities should be considered too trivial for prompt and careful adjudication.**

8 **Promotions, wage changes, and disciplinary action should always be approved by the executive immediately superior to the one directly responsible.**

9 **No executive or employee should ever be required, or expected, to be at the same time an assistant to, and critic of, another.**

10 **Any executive whose work is subject to regular inspection should, whenever practicable, be given the assistance and facilities necessary to enable him to maintain an independent check of the quality of his work.**

By courtesy of the American Management Association, which holds the copyright, we are enabled to present these Ten Commandments. *Factory* considers them "must" reading by every plant-operating executive

How Industry and Colleges Train Methods Men

TWO CASE STUDIES

No. 1—Bradley Polytechnic Institute, Peoria

No. 2—Northeastern University, Boston

FACTORY MANAGEMENT and MAINTENANCE Plant Operation Library, No. 48

Case Study No. 1
Bradley Polytechnic Institute

Contributed by MARVIN E. MUNDEL
Assistant Professor of General Engineering

"HAVE YOU A PROBLEM from your company—office work, machine shop work, foundry work, assembly work? Bring it to class, learn your techniques while you work on it. If it is too bulky, and if your company will grant permission, we will take the equipment to your plant." This was the invitation to the 25 students at Bradley Polytechnic's (Peoria, Ill.) course in motion and time study, given to local industrial employees as part of the engineering defense training program sponsored by the U. S. Office of Education in the spring of 1941.

This first group of trainees came from six Peoria and suburban industries. The class had been meeting for five weeks, with two 2-hour night classes a week, hours of informal discussion after class, and with about 4 hours of home study per week. The necessity for motion and time study, basic approaches, and what they could accomplish had already been discussed.

To provide training applicable to the types of problems encountered in their plants, and to accomplish useful work at the same time, the subject matter was thereafter studied and applied immediately to an actual job in production at a plant. Thus the techniques more easily became part of the trainees' working knowledge.

The class was divided into groups with two, three, or four men working on a single project. This division was made to provide a sub-group to discuss the "task," to give a variety of viewpoints on each task, and to stimulate individual thinking by providing several "improvers."

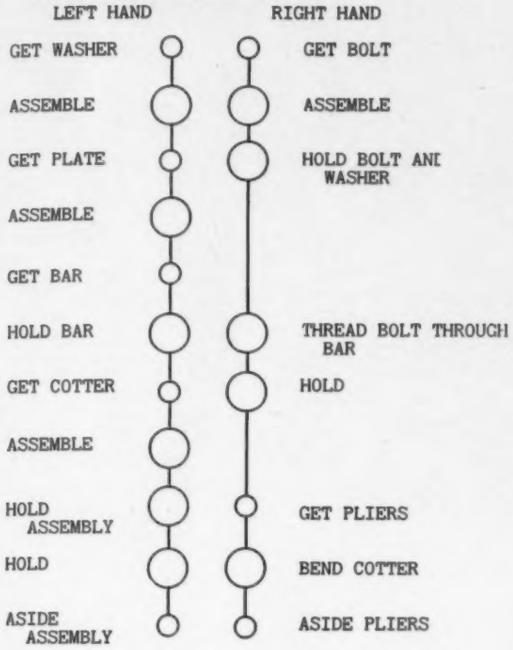
Task study was started at the seventh week of the course. Lectures were short and meaty. Questions brought up by participants were discussed during the lecture only if they were of interest to the entire group. Other questions were treated indi-

OUTLINE OF COURSE

These men not only learned motion economy but put it to work at the same time

Week	*Lecture and Discussion Topic*	*Laboratory Work*
1	What motion and time study can do Outline of techniques used Process charts in detail	Problem in process charting
2	General approach to process improvement Operation charts in detail	Analysis of previously charted process Problem in operation charts
3	Micromotion technique Mechanics of filming	Filming of rudimentary operation
4	Therbligs and use	Analysis of films taken
5	Simo-charts	Simo-charts of operations filmed
6	Use of basic data in improvement of tasks	Application to tasks filmed
7	Principles of motion economy	Process charts of "tasks" from plants
8	Stopwatch time study	Time study of "tasks"
9	Illustration of application of principles of motion economy	Filming "tasks"
10	Discussion of rating and fatigue	Filming, analysis etc. of "tasks"
11	Class discussion of "tasks" under way	Filming etc. of "tasks"
12	Therblig check lists and how they are used	Application to "tasks"
13	Motion economy	Application to "tasks"
14	Motion economy	Application to "tasks"
15		Filming, time study etc. of improved methods
16	Discussion of results of work on "tasks"	Filming etc. of improved methods
17		Final work on methods reports
18	Selling motion and time study in plants resisting change	

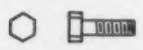
ORIGINAL METHOD



PRODUCTION - 108 Assemblies/hour

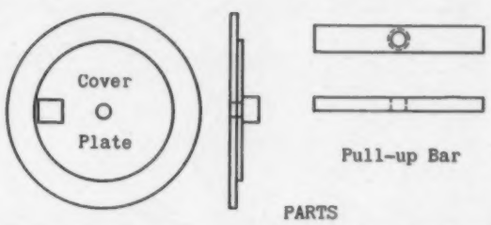
ASSEMBLY OF ENGINE HAND-HOLE COVER

WORKPLACE



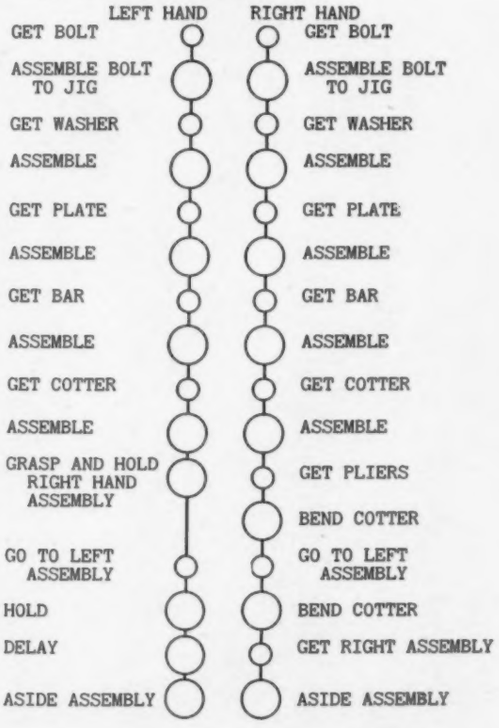
1/2" x 2" Bolt

Copper Washer



PARTS

IMPROVED METHOD



PRODUCTION - 185 Assemblies/hour

INCREASE IN PRODUCTION - 71%

ASSEMBLY OF ENGINE HAND-HOLE COVER

IMPROVED WORKPLACE

Increase in production made possible through:

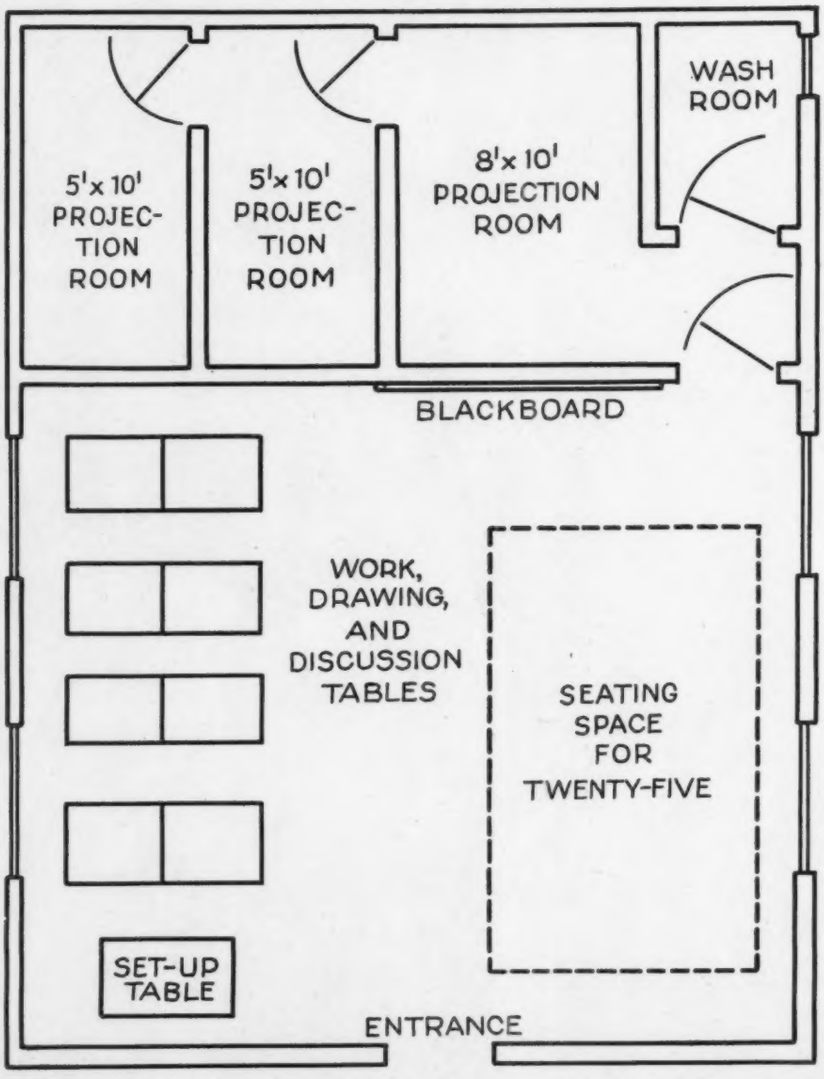
1 - Use of hand for holding device for most of cycle eliminated

2 - Work arranged so that the hands are used in simultaneous and symmetrical fashion producing two assemblies at the same time

3 - Small parts requiring visual direction in grasping placed directly in front of operator

4 - Inertia used to help assembly. Heavy bars are spun instead of laborious twisting of bolts previously used.

The instructor checks the camera setting to insure good films, but the trainee sets it up and makes his own micromotion studies



Some students take pictures while others analyze their films in the separate projection rooms. Each trainee analyzes his own film

vidually sometime later in the evening.

Each task was first aproached with the process chart. Were all the operations necessary? One operation removed by this analysis was particularly outstanding. Plant magazines had been inserted laboriously by hand into envelopes previously hand addressed. Analysis brought up the question—"Why the envelope?" Investigation revealed that new addressing machinery would be sufficiently fast to address the printed magazine itself, and do away with the need for envelopes. The entire original process was eliminated, and the company saved an estimated $16,000 a year.

A process chart was used also to investigate whether operations took place at the right location in the sequence—whether they could be combined—which operations were bottlenecks—which were costly?

From these investigations a particular operation was selected for further investigation. A time study of the operation was taken to establish a value for future comparison. This, of course, involved the preparation of a task description of sufficient detail to serve as a complete instruction sheet.

Then a micromotion study was made with the Institute's 16-mm camera. Large film supplies made it possible for each man to set up the camera and equipment and take films himself, and thus get this mechanical part of the technique "down pat." Trainees did this part of the work themselves, the instructor merely checking the final camera settings to assure good films for analysis.

Film Analyses

Each trainee made his own film analysis. Separate projection rooms, which could be kept completely dark while films were being made in the other sections of the laboratory, made this easy and did away with interference between various activities. The projectors were made available every night of the week, and they ran hot from 7 to 11 p.m., and later. Film analyses were made, compared, and checked within the sub-groups. Simo-charts were made in color.

Then the detailed "principles of motion economy" were introduced, accompanied with films of demonstration applications. After each rule was discussed, the class broke up into the sub-groups. Each group tried to apply the rule to its task. The men evaluated the results against the original standard with stopwatches. Optimum conditions for the performance and order of the finally selected

therbligs were sought. Groups sat in with other groups in rotation to broaden their experience.

Each task was set up with the new workplace built, if possible, on a 30x40 5-ply board, which could be cut for drop deliveries, have jigs nailed or screwed to it, have foot pedals attached if necessary, and so on. The workplace had four bolt holes by which it could be attached to an angle-iron topless table framework for actual use. Other special tables, jigs, and the like were built during the day by regular college students in the Bradley shops, working from drawings prepared by the defense trainees.

New methods were standardized, instruction sheets prepared, and film records of the improved task were made, analyzed, and studied. A final time standard for the resulting improved method was set in the same manner as the original comparison value. Four months after the first class meeting, trainees made their final reports. These reports were not vague academic papers but concise methods reports. A copy was delivered to the plant concerned, showing how from 36 to 350 percent increase in output, without increase in effort, could be obtained. In several cases this was accompanied by jigs sufficiently sturdy to be used in regular production.

TASKS IMPROVED

	Job	Old time (min.)	New time (min.)	Percent Increase in Production
1	Gaging shell plugs	.106	.0241	350
2	Enveloping plant magazine	Job eliminated, $16,000 saved per year		
3	Core molding	.326	.222	47
4	Glove turning	.183	.135	36
5	Assemble hand-hold cover plate	.556	.325	71
6	Assemble ironer shoe	1.35	.89	52
7	Assemble engine breather	1.94	.74	161
8	Assemble tail-gate roller	.405	.181	124
	Average increase in production			120 percent

Case Study No. 2
Northeastern University

Contributed by WARREN L. GANONG
Instructor in Methods Engineering

THE METHODS ENGINEERING laboratory at Northeastern University, Boston, has been called upon to play a new role—that of training men in industry to expedite defense production. Since last January, Northeastern University has been cooperating with the federal government in its engineering defense training program. The purpose of the program has been the upgrading of men in defense industries, to provide them with additional skills which will enable them to play a more vital part in the stepping up of defense production. Given two nights a week, three hours a night, for six weeks, the course is necessarily intensive and calls for diligent application on the part of the students.

Using Prof. Ralph M. Barnes's text "Motion and Time Study," the first week is devoted to a discussion of the principles of motion economy, use of process charts, operation charts and their purpose, therbligs, and so on. Then the men, working in pairs, are assigned a relatively simple industrial assembly problem; or better still bring in from their own factories an assembly problem which needs attention. Their job is to design and construct at minimum expense the necessary jigs, fixtures, special tools, or equipment required, and lay out a workplace for the assembly of the parts, paying close attention to the principles of motion economy. Next, with one man of each pair acting as an operator, a motion picture is taken of the new method of assembly and, if time permits, of the old method.

When the developed film is returned, the men make a detailed micromotion analysis, one of the most valuable parts of the course, since film analysis aids tremendously in developing motion-consciousness. Finally each man constructs a simultaneous-motion-cycle chart from the film analysis data.

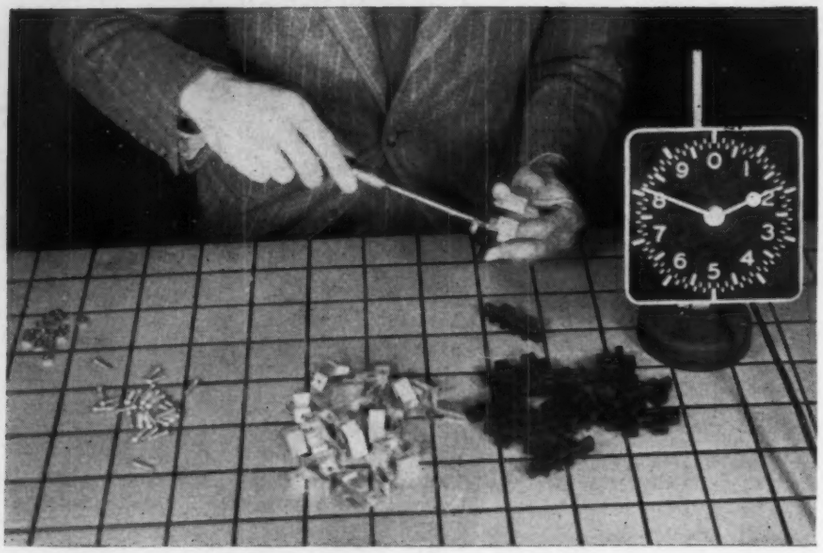
One or two evenings are devoted to time study practice, rate-setting, and to a discussion of the more common methods of wage payment. In addition, during the third week a plant layout problem requiring 15 or 20 hours for solution is assigned. Here again each man is encouraged to find his problem in his own plant, and to make a new layout of some department in his factory.

Results? The assembly time for one assembly was reduced from 67 seconds per piece to 69 seconds per two pieces, using a double-assembly fixture with a foot ejector. Another assembly, difficult to improve upon, was reduced from 37 to 26 seconds.

Practical Use

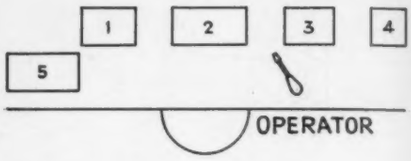
Even before finishing the course, many men have indicated that they are putting to practical use the principles they are studying. The foreman in the local plant of one of the largest electrical manufacturers has eliminated one of his headaches, one of those little nuisance jobs that doesn't look like much but never seems to get done and holds up the bigger jobs. By changing the layout and making a new set-up with parts from the scrap pile he transformed this "headache" job into one that he takes pride in telling about.

It may be well to point out that the course stresses the teaching of principles rather than attempting to make a show of enormous savings on the assembly jobs analyzed in the



L.C.H. Contactor Assembly

1-Bodies
2-Contactors
3-Screws
4-Nuts
5-Finished assemblies



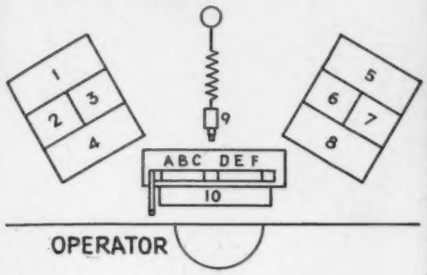
ORIGINAL METHOD

LEFT HAND	RIGHT HAND
GET ONE PLASTIC BODY FROM POSITION 1 . .	GET ONE CONTACTOR FROM POSITION 1
	ASSEMBLE TO FIRST SPACE IN BODY
	GET ONE SCREW FROM POSITION 3
	ASSEMBLE SCREW TO BODY AND FIRST CONTACTOR
	GET ONE NUT FROM POSITION 4
	ASSEMBLE NUT TO END OF FIRST SCREW
	GET SECOND CONTACTOR FROM POSITION 2
	ASSEMBLE TO SECOND SPACE IN BODY
	GET SECOND SCREW FROM POSITION 3
HOLD BODY, RE-POSITIONING AS NECESSARY .	ASSEMBLE TO BODY AND SECOND CONTACTOR
	GET SECOND NUT FROM POSITION 4
	ASSEMBLE TO END OF SECOND SCREW
	GET THIRD CONTACTOR FROM POSITION 2
	ASSEMBLE TO THIRD SPACE IN BODY
	GET THIRD SCREW FROM POSITION 3
	ASSEMBLE TO BODY AND THIRD CONTACTOR
	GET THIRD NUT FROM POSITION 4
	ASSEMBLE TO END OF THIRD SCREW
	GET SCREWDRIVER FROM BENCH
	TIGHTEN THREE SCREWS
LAY ASIDE FINISHED ASSEMBLY AT LEFT. . .	LAY ASIDE SCREWDRIVER ON BENCH

TOTAL TIME=67 SECONDS PER ASSEMBLY

L.C.H. Contactor Assembly

1 and 5 - Contactors
2 and 7 - Nuts
3 and 6 - Screws
4 and 8 - Bodies
9 - Suspended power screwdriver
10 - Drop delivery

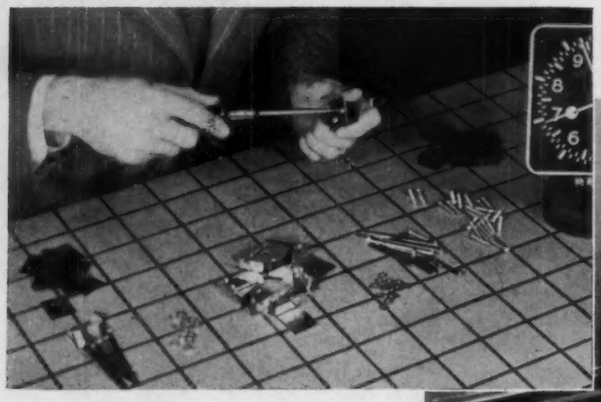


IMPROVED METHOD

LEFT HAND	RIGHT HAND
GET TWO NUTS FROM BIN 2.	GET TWO NUTS FROM BIN 7
PLACE NUTS IN SLOTS A & B IN FIXTURE . .	PLACE NUTS IN SLOTS F & E IN FIXTURE
GET THIRD NUT FROM BIN 2	GET THIRD NUT FROM BIN 7
PLACE IN SLOT C IN FIXTURE	PLACE IN SLOT D IN FIXTURE
GET PLASTIC BODY FROM BIN 4	GET PLASTIC BODY FROM BIN 8
PLACE BODY OVER TWO LOCATING PINS ON LEFT END OF FIXTURE.	PLACE BODY OVER TWO LOCATING PINS IN RIGHT END OF FIXTURE
GET ONE CONTACTOR FROM BIN 1	GET ONE CONTACTOR FROM BIN 5
ASSEMBLE TO BODY OVER SLOT A	ASSEMBLE TO BODY OVER SLOT F
GET 2nd CONTACTOR FROM BIN 1	GET 2nd CONTACTOR FROM BIN 5
ASSEMBLE TO BODY OVER SLOT B	ASSEMBLE TO BODY OVER SLOT E
GET 3rd CONTACTOR FROM BIN 1	GET 3rd CONTACTOR FROM BIN 5
ASSEMBLE TO BODY OVER SLOT C	ASSEMBLE TO BODY OVER SLOT D
GET ONE SCREW FROM BIN 3	GET ONE SCREW FROM BIN 6
ASSEMBLE TO BODY AND FIRST CONTACTOR . .	ASSEMBLE TO BODY AND CONTACTOR F
GET SECOND SCREW FROM BIN 3.	GET SECOND SCREW FROM BIN 6
ASSEMBLE TO BODY AND SECOND CONTACTOR. .	ASSEMBLE TO BODY AND CONTACTOR E
GET THIRD SCREW FROM BIN 3	GET THIRD SCREW FROM BIN 6
ASSEMBLE TO BODY AND THIRD CONTACTOR . .	ASSEMBLE TO BODY AND CONTACTOR D
ASSIST RIGHT HAND.	GRASP SUSPENDED POWER SCREWDRIVER
ASSIST RIGHT HAND.	TIGHTEN SIX SCREWS
RELEASE SCREWDRIVER AND MOVE TO BIN 2. .	RETURN SCREWDRIVER TO SUSPENDED POSITION AND MOVE TO BIN 7

TWO FINISHED CONTACTOR ASSEMBLIES ARE
EJECTED INTO DROP DELIVERY CHUTE BY FOOT-OPERATED LEVER

TOTAL TIME = 34 SECONDS PER ASSEMBLY



OLD METHOD

NEW METHOD

Time consumed in assembling a contact maker by the old method was 37 seconds. In the new method, with both hands busy all the time, new set-up, and pre-positioned screwdriver, the time is 26 seconds—a saving of 11 seconds. Provision is made for drop-delivery, and there is no waste motion

laboratory. On the other hand, whenever we feel that we have developed a specially good method for a job, we offer it for what it is worth to the firm whose part is involved. Firms in the Boston area have been very cooperative with the University in supplying practical assembly problems from their shops for solution in our laboratory. To mention a few with whose parts we are working, there are The Foxboro Company, Bolta Company, Hersey Manufacturing Company, Hygrade Sylvania Corporation, and A. H. DuGrenier, Inc.

We have an understanding with these firms to pass along whatever worth-while ideas come out of the laboratory. In many cases a man from the firm is assisting in solving the problem presented by his company. It is an arrangement that proves beneficial to all parties concerned.

Now in Use

A case in point is that of Arthur Holmberg, a new member of the methods department at The Foxboro Company, whose problem for micromotion analysis was an air-switch assembly for a new instrument just going into production. Since Mr. Holmberg had been a tool and die maker, the fixture which he designed on motion economy principles and constructed during the course is now in use on the production floor in the factory. More direct application of the principles of a course is hardly conceivable.

C. Russell Shaw, a former employee of Nashua Gummed & Coated Paper Company of Nashua, N. H., worked upon that time-worn assembly of two license plate fasteners and the attendant parts to a display card. His new method of assembly, making use of a self-designed motor-driven friction tightening device, lopped 20 percent off the previous hand method of assembly.

A specific instance of the collaboration which can be achieved between a specific firm and an institution offering a defense training course is that which resulted when we decided to work up a new problem in plant layout. After hearing an explanation of our purpose, G. W. Olson, division manager, Robert Gair Company, Newton, agreed to allow one of our instructors to make a layout of his present production facilities with the purpose of building around it a problem involving the revision of plant layout through process chart analysis. It was readily agreed, of course, that we present the firm with a blueprint of the layout as it now exists, as well as with several of the best solutions obtained.

In working on the problem some of the men felt that a visit to the factory would help clarify some of their uncertainties regarding the process. Mr. Olson readily agreed to a plant visit by the class members. At this writing we have not finished working on this particular problem so the results remain to be seen. But when industry, the federal government, and educational institutions can cooperate and put their heads together in this fashion the results are bound to make the wheels turn faster for the defense of these United States.

Essential Motions

An officer from a nearby arsenal has been viewing his production facilities and methods with a more critical eye since being exposed to the course. "The location of the machines is an important factor here, and at present there is no order whatsoever." He also emphasizes the value of incorporating proper methods instruction in the training of new operators. "We have an apprentice training school for machine operators which would be a fertile field for teaching the motion study principles of this course, stressing essential motions and the elimination of unnecessary ones which trainees are so apt to use."

Enrolled in the course have been men representing a cross section of defense production; they have come from the local arsenal and the electrical industry, the Ordnance Department and a shoe manufacturer, an instrument maker and the shipyard. Uncle Sam is beginning to earn dividends on his investment in education for men in defense industries.

Luxury Goods, Too, Must Be Closely Controlled

Here is production planning as practiced by one of the great names in America's big cosmetic industry—a system that maintains high inventory turnover, eliminates back orders, keeps production flow in tune with the merchandising calendar

HARRY F. WATERHOUSE, Engineer, Ross, Wells & Company, New York

Close planning makes long runs—hence mass production methods—possible even on the most seasonal items. Here factory manager and department supervisor look for minor flaws in a newly installed conveyor line where gift packages of Heaven Sent toilet water and soap are being made up

PRODUCTION PLANNING and control in a modern cosmetic manufacturing plant involves some interesting problems in coordinating manufacturing with sales, and in accomplishing the various time objectives in manufacturing operations. The industry is one of rapid style changes. Some of the products are sold only during certain well-defined seasons, and in general the advent of products in the market must be closely tied in with the advertising calendar.

At the laboratory and plant of Helena Rubinstein, Inc., in Long Island City, the problems of planning and production control have been carefully studied, and a system that results in a close coordination of all production has been evolved.

The system involves five simple steps:

1. Forecasting the sales for a period in advance.

2. Determining the quantity of items to be produced—based on estimated sales and desired inventories.

3. Arranging a time schedule of production.

4. Calculating the requirements in

2 FORM B — PRODUCTION ESTIMATE AND SCHEDULE

PRICE	NAME OF PRODUCT	CODE	DESIRED INVENTORY AS OF:	SALES FORECAST FROM: TO:	ON HAND DATE:	TOTAL PRODUCTION ESTIMATE FROM: TO:

1 FORM A—MONTHLY SALES FORECAST

MONTH OF: _____

DEPARTMENT:

PRICE	NAME OF PRODUCT	CODE	REGULAR SALES FROM: TO:	ESTIMATED TREND FACTOR (%)	PRELIMINARY SALES FORECAST (No. 1 & No. 2)	PROMOTION SALES ESTIMATE	REGULAR AND PROMOTION SALES FORECAST

3 STOCK ORDER

(REGULAR) (ADD ORDER)

DATE _____

NUMBER _____

DEPARTMENT: _____

THE FOLLOWING PRODUCTION WILL BE RUN ON _____

CODE NO.	ITEM	PRICE	QUANTITY

4 H. R. CONTAINER CO. Inc.

FILLING AND FINISHING

PRODUCTION ORDER

PRODUCTION ORDER No.: _____

DATE: _____

PRODUCT _____

BULK QUANTITY

DATE RECEIVED

PURCH. ORDER No.

CODE and DESCRIPTION	SIZE	PRICE	QUANTITY ORDERED	BALANCE ON ORDER	QUANTITY COMPLETED TODAY	TIME PRODUCTION START	TIME PRODUCTION END	ELAPSED TIME (Hours)	No. of Employees	Extended Hours	Production per Hour	Standard Content Weight or Measure	

All planning stems from the monthly forecast of sales (Figure 1). When the sales forecast has been checked against inventory, a 60-day production plan (Figure 2) is computed. From this plan production stock orders (Figure 3) are issued. Filling and finishing orders (Figure 4) are then issued for each day on each item

REMARKS:

SHORTAGE OR OVERAGE

CHECK HERE IF ORDER IS COMPLETED

SCHEDULE

FROM: TO:

SALES		PRODUCTION		INVENTORY	
FORECAST	ACTUAL	SCHEDULE	ACTUAL	END PREVIOUS PERIOD	MOST RECENT CHECK

SCHEDULE

FROM: TO:

SALES		PRODUCTION		INVENTORY		SAL
FORECAST	ACTUAL	SCHEDULE	ACTUAL	END PREVIOUS PERIOD	MOST RECENT CHECK	FORECAST

FROM:

#544

Nov. 8, 1941 11-3-41

5

Pasteurized Cream - Special 1000 Lbs.

4018 - 3 oz.

342 - 8 oz.

Requisition #9286 - 9287

Production Order 291

Req. Nº 8750

H. R. CONTAINER CO., INC.

6 SUPPLY REQUISITION ORDER

For Production Order No. Date

CODE NO.	QUAN.	SIZE	ITEM

Follow-up ticket (Figure 5) goes into the planning department file, is used to indicate production to be run each day. Requisition for supplies (Figure 6) is made in duplicate – one copy for the warehouse, one for the planning department. Operations card (Figure 7) shows how much production can be expected from each machine, gives basis for forecasting labor requirements

CODE SIZE PRICE PRODUCT

7 OPERATIONS

NO.	DESCRIPTION	PRODUCTION PER OPERATOR HOUR		NUMBER OF OPERATORS			
			TOTAL				

STANDARD OUTPUT PER OPERATOR HOUR:

REMARKS:

CONTINUED ON NEXT PAGE

bulk materials, supplies, and labor, and issuing the necessary orders and requisitions.

5. Follow-up to insure that the schedule is adhered to.

Sales are forecast for 60 days in advance, by a trend factor for each type of product, which is applied against current sales for each item of that product. This is compiled on Form A (Figure 1) by the planning clerk.

The planning department calculates the quantity of each item that should be on hand at the end of any inventory period. These quantities are computed by a simple formula, taking into account deterioration rates and the amount of stock management thinks it advisable to carry. For example, it may be decided during the summer months to maintain a two-weeks' supply of some item, whereas during the colder season the specified quantity may be enough for a month. Similarly, at other seasons the completed stocks of certain products may intentionally be held low.

With a knowledge of the sales forecast for each item, and of the desired inventory, the planning clerk computes quantities to be produced over a 60-day period. These figures are entered on planning Form B (Figure 2).

After the monthly production estimates have been made, it is decided when, during the month, production will be run, so that supplies may be secured in time, and so that there may be a smooth flow of work.

Scheduling is done in two steps. First, an over-all plan for production of completed items by half-month periods is prepared. (Figure 2); second, from this plan production stock orders (Figure 3) are issued.

Orders Issued

Each half-month schedule is then further subdivided into days, and purchase orders for bulk materials are issued, showing the dates on which the material will be required. Follow-up tickets are prepared, and filed under the dates on which the production will be run. Filling and finishing orders (Figure 4) are then issued for each day on each item.

The "stock order" (Figure 3) is used, as its name implies, to indicate that certain production will be run for stock.

The form is made out by the planning department and copies are sent to: Purchasing, stock records (statistical), laboratory, planning, factory superintendent.

Stock orders are made out when the new two-month schedules are prepared, on or about the first of each month. Separate stock orders are issued to cover each half-month interval, four orders for every two-month schedule. In addition, supplementary orders are issued, usually twice each month, to cover additions to or cancellations from regular stock orders.

It should be noted that by this procedure any errors in sales' forecasting for a half-month, or any deviations from the schedule, are automatically picked up and added to the figures of the next half-month.

Supplementary, or "add orders," are used to cover excess production brought about by overruns due to normal variations in batch sizes, or by requirements in excess of the original estimates. "Cancel orders" are used to cover underruns or downward revisions in the production schedule.

When the purchase order for bulk materials is prepared, a follow-up ticket (Figure 5) also is made for the planning department file.

It is a plain 5x8 white card showing date of filling and finishing; purchase order number and date; description and quantity of bulk material; code numbers, prices, sizes, and de-

(*Continued on page 156*)

Filling and labeling machines are on casters, so packaging lines are quickly made up and as quickly broken down to accommodate short or long production runs. Here, Heaven Sent (eau de toilette) line

How Industry Is Regulated in Wartime Britain

Brief outline of the principal regulations designed to free labor, factory space, and materials for the war effort—contributed by British Press Service, New York

1. Materials Control

Raw material control was established at the outbreak of the war and covers all essential commodities: aluminum, hemp and flax, jute, leather, silk, cotton, wool, nonferrous metals. The allocation of controlled materials to manufacturers depends upon the nature of the manufacturers' products, first consideration being given to war commodities.

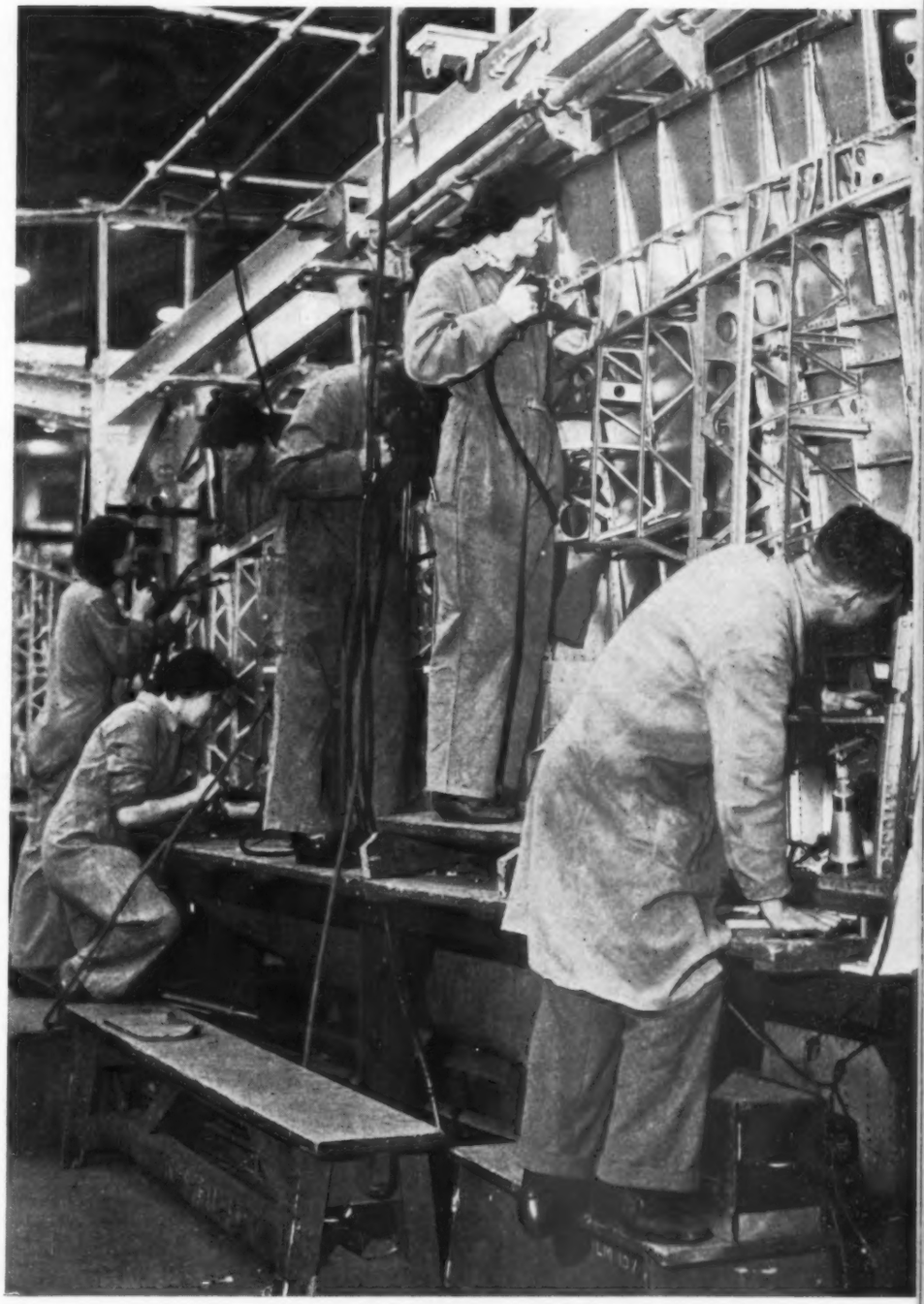
2. Supplies Limitation

Consumers' goods of finished manufacture are supplied to retailers according to a quota of the goods supplied during a standard period (April 1, 1939—September 30, 1939). For example, cotton, silk, linen, piece and made-up goods are now supplied in only 20 percent of the quantities in which they were supplied in the standard period of 1939. Rayon piece and made-up goods are limited to a 40 percent quota. Limitation of Supplies Orders cover practically the whole field of ordinary peacetime consumers' goods—clothes, footwear, hosiery, leather, paper, furnishings, pottery, lighting fittings, photographic materials, toys, toilet goods, jewelry, and so on. It was recently estimated that at present the reduction in goods available for sale is about 50 percent although the full effects of this reduction have not yet been felt owing to the existence of a "cushion" of accumulated stocks, now rapidly shrinking.

3. Industry Concentration

Measures for the concentration of production which were announced in March, 1941, do not restrict the production of consumers' goods below the level imposed by the Limitation of Supplies Orders. The measure is intended to prevent factories, whose output is restricted by the Limitation of Supplies Orders, from continuing to work part-time. Firms in these in-

(*Continued on page 150*)



Women and men work side by side in the British effort to attain maximum airplane production for their country's defense

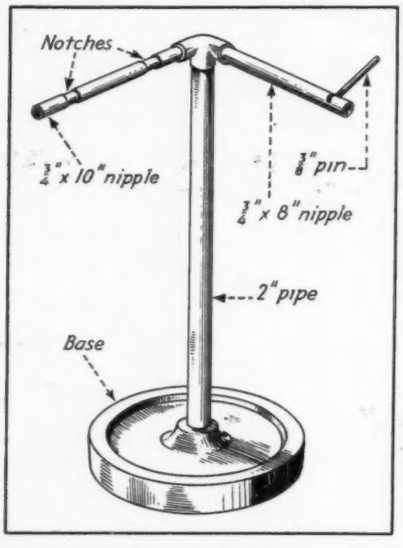
MANAGEMENT SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary management accomplishments. Accepted articles will be paid for

Support Helps Handle Pipe, Shafting, Tubing

J. MURPHY, Lakewood, Ohio

Here is a shop helper we find rather handy for handling bars, shafts, pipe, tubing, and the like, at drill, arbor, or punch presses, or cut-off saws. It consists of a section of 2-in. pipe mounted vertically in a heavy base. Most any discarded flywheel or gear will do for the base.



At the top of this pipe we use a three-way tee and two short nipples. One nipple has two notches cut in it to handle small stock. The other nipple has a swivel pin at the end, which can be raised to a vertical position to retain a bar or other object. If not needed, the pin can be swung out of the way.

As the elbow provides a certain amount of movement to right or left, or up and down, you can see that this hookup makes a rather handy adjunct for the erecting shop.

•

Movable Bumper for Roller Conveyor

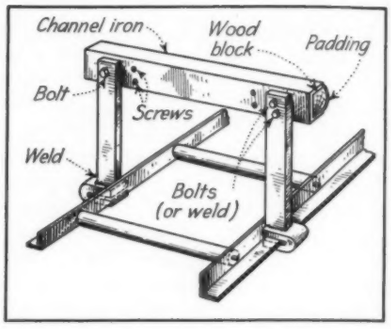
S. R. TERANES, St. Louis

There is often need for a movable stop or bumper where stock is removed at different points along a gravity roller conveyor. When the material must travel some distance on sufficient pitch to carry it to the point of delivery, the momentum gained in traveling that distance results in a powerful impact on the bumper, even though the material be of light weight.

To get a bumper to withstand the constant blows, and still stay put, presents a problem, especially if the bumper must be frequently moved to different stations along the conveyor.

The bumper shown here can be quickly moved from one location to another by simply swinging out the swiveled arm, lifting the bumper off the conveyor, and carrying it to the next unloading point. It remains in position and will withstand powerful blows.

The U-shaped clamping pieces, which fit over the conveyor channels, are made first by bending a section of ¾x2½-inch steel to shape. The uprights, made of the same stock, are then welded to these pieces. If facilities of a forging shop are available, the uprights can be made in one piece by taking a longer piece of steel, bending one end to form the U-



(Continued on page 172)

Management, How Good Is Your Control?

Ask yourself these questions to check up

15. TOOLS

1. Are present tools satisfactory? Do they meet all manufacturing demands? Should more tools be procured? Are there new designs to facilitate work in tight places? New tools that handle more easily?

2. Are tools properly cared for? Cleaned? And stored? Is there undue loss or breakage?

3. Are toolholding racks provided? Are they placed handily on side of machine or jigs? Are they being used?

4. Are tools sufficient? Are there any essential tools which should be supplied? Are there too many unessential tools?

5. Are tools properly pre-positioned? Are they being returned to pre-position after each using? Are setting-up and cleaning tools pre-positioned?

6. Are proper safety rules and regulations being followed in use of tools? Have guards been set up where necessary?

7. Can electric and air lines be relocated so as to be up out of the way? Would reels on electric drill lines be practical? Too expensive? Are there sufficient electric and air outlets? Are they conveniently located?

8. Do you exercise any control over visits of your men to tool crib? Are there too many such visits?

9. Do you make any examination of the workmen's personal tools (type of screwdrivers, etc.)?

10. Do you have a list of types of personal tools considered necessary for production of proper quality and quantity of work? Is such a list posted?

11. Do you explain to the workmen the advisability of having proper types of tools?

Next Month: Safety

Prepared by HARDING PALMER, *Industrial Engineer*
Lockheed Aircraft Corporation, Burbank, Calif.

MAINTENANCE SERVICES

SELECTION • INSTALLATION • INSPECTION • UPKEEP • ORGANIZATION

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FACTORY MANAGEMENT AND MAINTENANCE

McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42d STREET, NEW YORK, N. Y.

MAINTENANCE as the Editors See It

Budgets Keep Maintenance Costs Well in Hand

"We made a maintenance budget the first of the year, then we put it away and haven't thought of it since. Everybody in our plant is too busy getting out production to worry about maintenance costs."

From another plant engineer: "Maintenance costs are being watched just as closely as ever. We can't afford to let them get away from us."

Here are two opposing viewpoints. Which is to be recommended?

Without question, production is a desperately urgent matter in a great many plants, particularly in those engaged in defense work. It is also true that in many plants rigid adherence to a close budget has been very difficult, maybe impossible, this year. Some conditions were hard to foresee a year ago. Equipment of all kinds is being worked harder, tested more ruthlessly, than ever before. It is wearing out faster, needs more attention than it would under normal conditions. That means higher maintenance costs.

It does not follow, however, that such costs cannot be controlled or should not be watched closely. Maintenance expenditures can easily get so far out of hand that they eat deeply into profits. Without some mark to shoot at, such as is provided by a budget, planning of work tends to become slipshod and execution becomes inefficient. The maintenance dollar then shrinks in value.

Business is good, yes. But it's never good enough to justify waste and inefficiency. Therefore we recommend that maintenance costs be budgeted and controlled just as carefully as in leaner days.

Be Sure You Understand Provisions in P-22

Latest amendments to Preference Rating Order P-22 tend to liberalize, rather than narrow, its provisions. That is good news to everyone concerned with the problem of obtaining maintenance and repair materials.

It was virtually inevitable, of course, that OPM should recognize the importance of keeping important facilities and industrial plants not directly engaged in defense work in good operating condition by permitting them to obtain parts and materials needed for maintenance.

Any organization eligible to use the A-10 rating under P-22 can do so now simply by signing a specified endorsement on the order to the supplier. This endorsement states that the order covers material for maintenance, repair, or operating supplies. Also that the signer is familiar with the terms of P-22, as amended.

The latter provision is important to keep in mind, because P-22 embodies rigid definitions and stipulations. For example, maintenance and repair specifically mean keeping property in, or restoring it to, sound operating condition. Plant improvement or expansion is out, so far as P-22 is concerned. Operating supplies cover any material essential to operation of the business, and consumed in the course of such operation. Included are fuel, lubricants, and small, perishable tools. Such items must not, however, be physically incorporated into the product of the producer, or into any material which he acquires solely to distribute, store, or transport.

Penalties that may be imposed on violators of the provisions in P-22 are severe enough to make strict compliance highly advisable. Assurance that these provisions are being observed can be had only through careful study of the order, which we advise.

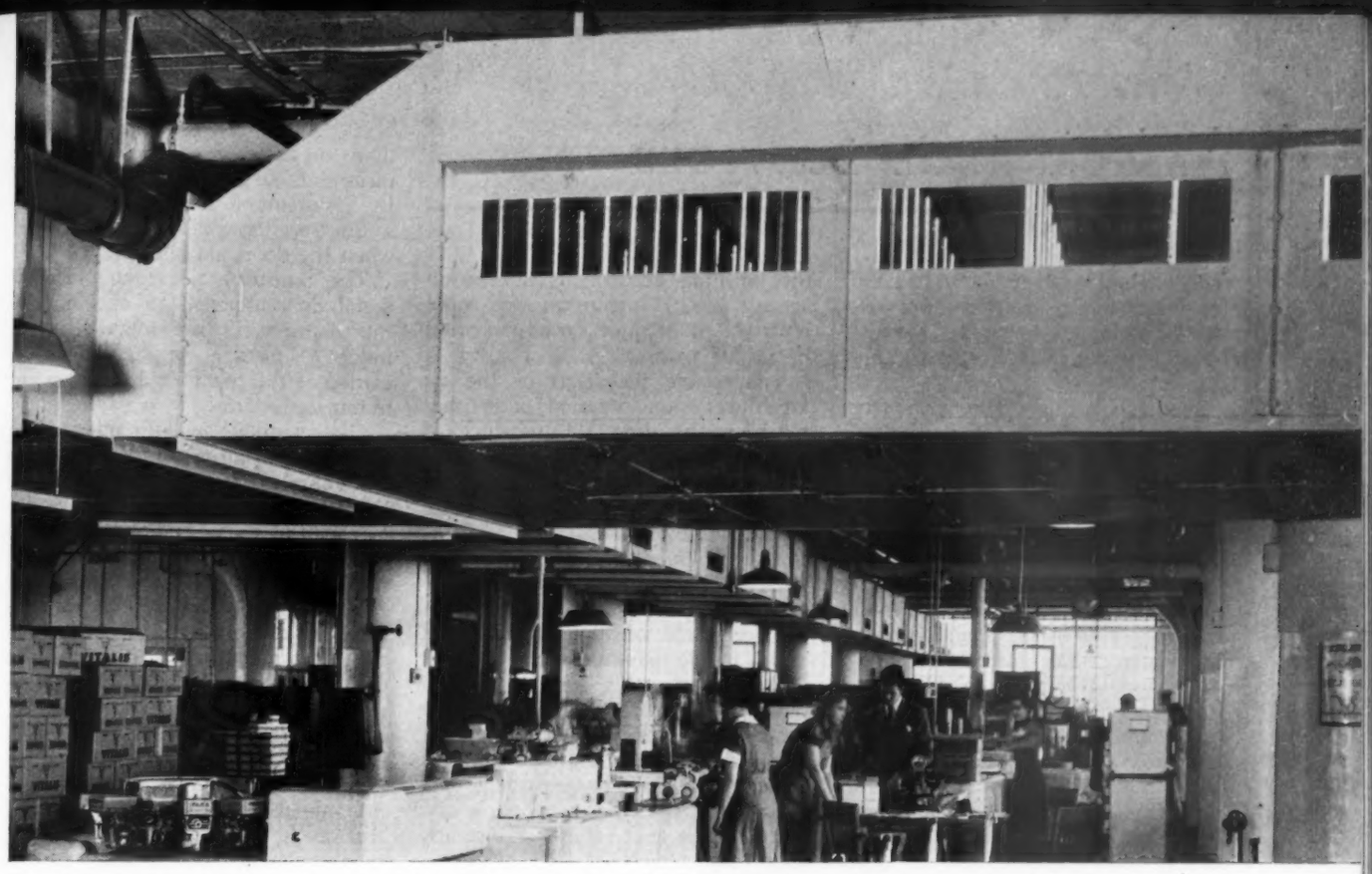
Electronic Devices Are Good at Solving Problems

Making every workman pass close to a simple metal plate on his way out solved, in one plant, puzzling thefts of valuable metal. The plate was connected to a tube circuit so arranged that when anyone who had a sizable piece of metal on his person went past, the balance was upset and an alarm sounded. When detection of thieves thus became automatic, thefts ceased.

Different but equally simple means were used to catch an employee who was suspected of studying the contents of confidential files. A pinch of a fluorescent powder was spread around these files. A day or so later some of the suspect's clothing was put under ultraviolet rays. Countless glowing specks on it, each literally a miniature fluorescent lamp, proved that he had been trespassing.

Within a comparatively few years electronic and allied devices of one kind or another have been adopted in large numbers by industry as the simplest solution of many difficult problems. Controlling welding machines, counting packages, matching colors, safeguarding operators, directing conveyor operation—are only a few of the many tasks that are being performed with precision and efficiency by electronic tube equipment.

What new uses will be found during the next few years for this kind of equipment, is anybody's guess. Certain it is that the development of electronic devices is still in swaddling clothes.



Air delivered to the finishing department passes through this chamber, which contains 104 30-in. bactericidal lamps. Ultraviolet radiation from the lamps immediately kills almost all the organisms in the air

Sterilized Air Cuts Illness, Gives Us Better Products

Before air is delivered to the finishing department it goes through a battery of bactericidal lamps, which kill practically all organisms normally present

H. C. JACKSON, Director of Industrial Relations, Bristol-Myers Co., Hillside, N. J.

GETTING RID OF BACTERIA in the air entering our finishing department was a problem that has now been solved by the installation of bactericidal lamps. I say solved because about 99 percent of the bacteria present in the air are destroyed before it enters this department.

The finishing department is located on the fourth floor of one of our main buildings and is 300 ft. long by 80 ft. wide. All our products are conveyed in finished form to this department where they are put in bottles or other containers and sealed. Throughout all the manufacturing processes every precaution is taken to prevent contamination. Several of the manufacturing departments are air-conditioned. In any event, all raw materials and products, both in semi-finished and finished form, are processed in closed containers and conveyed by pipe lines. Hence, practically none is exposed to the air until it passes from the filling machine into the container, which may be a bottle, tube, or jar. In their passage on a small conveyor from the filling machine to the machines that screw on the caps, the contents of the bottles or tubes are protected by transparent plastic plates on both side of and above the conveyor.

The finishing department was completely air-conditioned a number of years ago. Air-conditioning equipment comprises three refrigeration compressors, two driven by 50-hp. motors, and a smaller unit driven by a 25-hp. motor, humidity control equipment, filters, and so on. The system has a capacity of about 42,000 cu. ft. of air per minute. A temperature of 74 deg. F. and 45 percent relative humidity are maintained the year round.

These values represent the best compromise we can make between ideal conditions from the standpoint of health and comfort of the operators, and the optimum conditions for handling and packaging our products. For example, one of our products, Sal Hepatica, has a tendency to absorb

moisture and could therefore be handled under a considerably lower relative humidity. Air that is too dry, however, is not conducive to health or comfort.

Fresh air is drawn through a large duct in the side of the building at the level of the fifth floor. Dampers are set so that not less than 10 percent or more than 20 percent of fresh air is continuously introduced into the system, depending on conditions.

To operate the filling and other machines in the finishing department requires a total of 107 operators, mostly women. The majority of them must necessarily work in close proximity to other operators. We watch the health of our employees carefully and insist that any person who develops a cold or other illness stay home, on full pay, until he has recovered. Making those who happen to become ill stay home until they are well again is highly effective in preventing the spread of colds, say, but we felt that still more could be done to protect the health of employees and raise the quality of our products by reducing further any chances of contamination by air-borne bacteria.

It was obvious that sterilizing the air delivered by the air-conditioning system would go a long way toward accomplishing both these objectives.

Bacteriological tests of the conditioned air at the point of delivery to the finishing department showed an average of 103 organisms per cubic foot. None of these organisms could be classed as disease-producing, but it is conceivable that tests of the air taken over a longer period, or at other times, might show the presence of more harmful bacteria.

In view of the results obtained from installations in hospital operating rooms and elsewhere, it seemed to us that the simplest and possibly the most effective way of sterilizing approximately 40,000 cu. ft. of air per minute would be to use bactericidal lamps in the main air duct.

Accordingly, this duct was rebuilt and 104 30-in. bactericidal lamps were installed on 15-in. centers, as shown in the drawing. These lamps produce, by an electrical discharge through mercury vapor, ultra violet radiation of a wave length that is almost instantly fatal to bacteria.

Since these lamps require 500 volts they are operated four in series from a 3,000-volt transformer of the type used with neon and similar signs. A total of 26 transformers is required for these 104 lamps.

Each lamp is rated 15 watts and transformer losses are almost as much, so that current draw is between 25 and 30 watts per lamp.

It will be noticed in the illustration that the chamber containing the lamps is provided with twelve inspection doors on the under side. As a safety measure these doors are all kept closed by a system of latches tied in with a limit switch that cuts off power when the doors are opened.

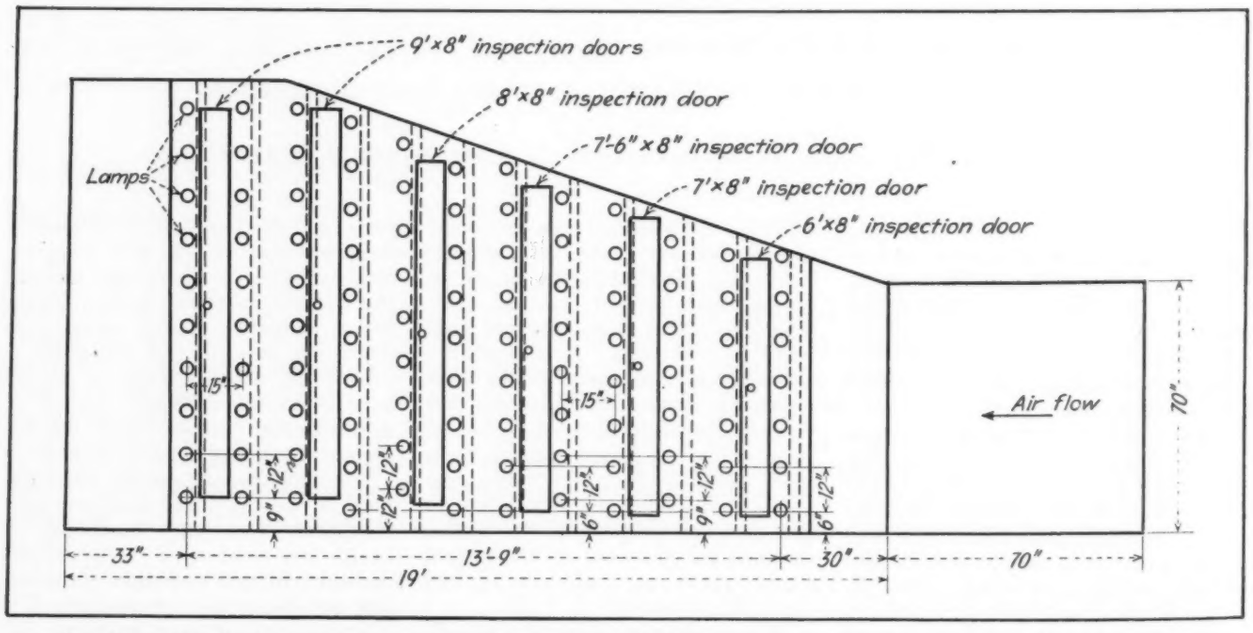
The transformers are housed in a metal duct attached to one side of the chamber, at the top. Also, as much as possible of the wiring is carried at the top of the chamber, to minimize hazards.

Glass windows in both sides of the chamber permit visual inspection to determine whether all lamps are operating properly. These windows are wire glass of special composition which prevents any of the ultraviolet radiation from reaching the operators' eyes.

The bactericidal efficiency of this installation is even somewhat higher than we had thought it would be. On a conservative basis it was estimated that 97 percent of the organisms passing through the duct could be killed. Actually, tests conducted after the lamps had been put in operation, about June 1 of this year showed that on the average there is now fewer than one bacterium per cubic foot in the air delivered to the finishing department. In other words, the bacterial efficiency is almost 100 percent.

As would be expected in view of these results, we have definite evidence that operators in the finishing department have been freer from colds and respiratory ailments.

There can be no question that the chances of any contamination of our products have been considerably reduced, even though they were never any greater than could be prevented.



Bactericidal lamps are staggered and spaced on 12x15-in. centers. Lamps are rated 15 watts each

Power circuits and equipment must be adequate because when they fail, production stops

Breakers Have Got to Break

Part 1. If they can't, it is almost a certainty that dangerous conditions will arise the first time a serious fault develops. Remedy is to make sure that breakers have interrupting capacity adequate to break the maximum short-circuit current

WAYMAN A. HOLLAND, Switchgear Division, General Electric Company, Philadelphia

WHEN A SEVERE OVERLOAD or short circuit occurs there is every likelihood of serious trouble if the protective devices do not have interrupting capacity adequate to clear the circuit immediately. Suitable voltage rating and ability to carry the load current are not enough.

Voltage and current ratings usually are well understood, and the selection of devices that will properly handle the normal voltage and current of a circuit is not difficult. Selecting adequate interrupting capacity is a different matter. Unless it is carefully considered, a capacity that is too low and therefore unsafe, or an unnecessarily high capacity, with consequent extra investment, may be selected.

The normal load current of a circuit is no definite indication of the magnitude of short-circuit currents that can be expected, or of the required interrupting capacity of the overcurrent protective device.

It has sometimes been stated that in circuits of 600 volts or less, short-circuit currents exceeding certain maximum values (varying from 20,000 to 40,000 amperes) were impossible. Modern experience has shown that such generalizations are unfounded, and in low-voltage circuits short-circuit currents well above 100,000 amperes have been observed.

The magnitude of fault currents in any electrical system depends upon the resistance and the reactance (impedance) of the circuit. Hence the possible magnitude of short-circuit current in any circuit is equal to the voltage divided by the impedance. A rigorously correct calculation of this current would require the value of the total impedance, including that of the local circuit plus the impedance of the lines and transformer between the protective device and the generator plus the impedance of the generators, including the transient and subtransient values. It would also include off-

Wayman A. Holland was born down in South Carolina. Received his B.S. degree in mechanical and electrical engineering from Clemson College in 1903. After a year in electrical installation work, he entered G.E.'s test course at Schenectady, served as switchboard requisition engineer until 1916. Thence to Sao Paulo, Brazil, to initiate, direct, and teach a course in electrical and mechanical engineering at Mackenzie College. Six years later he rejoined the switchboard engineering staff at Schenectady, transferred to switchgear division of the central station department at Philadelphia—his present position—in 1928. For relaxation he reads and grows flowers

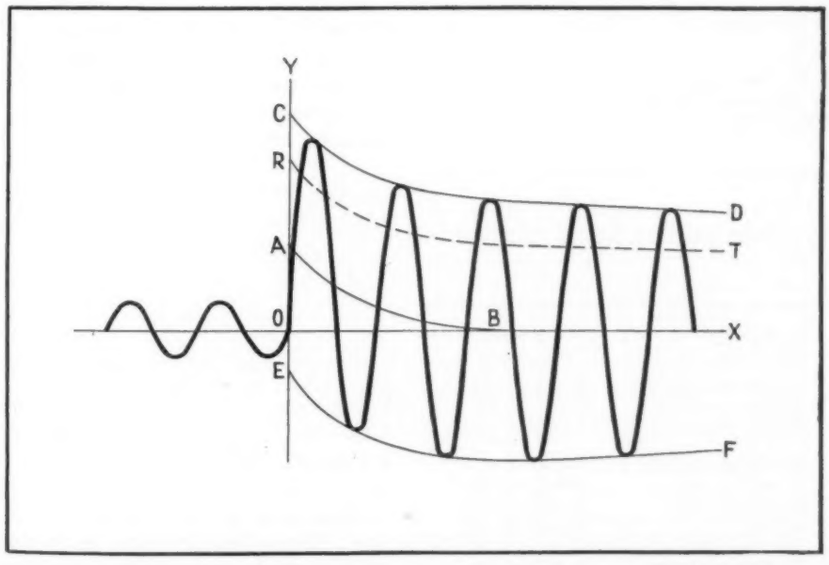


Figure 1. Here is a typical curve of the short-circuit current in one phase of a three-phase system. At left of O Y is normal current wave

set wave (direct current) components dependent upon the ratio of subtransient reactance to ohmic resistance, the time constants of the generators, and the period of time (in cycles or thousandths of a second) from the inception of the fault to the action of the interrupting device.

This sounds awesome, very theoretical, and too complicated for everyday use. And so it is. Fortunately there are ways of arriving at approximate values close enough for all practical purposes.

It is common practice to express resistance, reactance, and impedance of a.c. apparatus as a percentage; for example, 15 percent impedance. It means that the impedance is such that with normal current the voltage drop due to the impedance is equal to 15 percent of the normal voltage of the circuit.

Impedance, resistance, and reactance are also frequently expressed in "per unit" values, based upon the normal kilovolt-amperes of the apparatus. In other words the percentage value is expressed as a decimal, 15 percent becoming 0.15 p.u. Usually it is more convenient to employ the p.u. values in calculations, thus avoiding the cumbersome use of the 100 required when percentages are used.

For short-circuit current calculations it is necessary to add the various impedances in series, and for combinations of the p.u. values it is necessary to convert them all to the same, or common kilovolt-ampere base, usually the total kilovolt-amperes of the system.

The value of any impedance (or resistance or reactance) in ohms may be expressed in p.u. terms by:

P.U. Value on Base Kva. = *(Base Kva. x Ohms x 1000)* ÷ *Volts²*

Equation 1.

To express a p.u. value referred to one base (such as the rating of a certain piece of apparatus) to a different base (such as the kilovolt-amperes of the system), the following formula is used:

$$P.U.\ Value\ on\ Base_2 = P.U.\ Value\ on\ Base_1 \times (Kva.\ of\ Base_2 \div Kva\ of\ Base_1)$$

Equation 2.

The symmetrical short-circuit current in any circuit then is equal to the current corresponding to the reference base divided by the p.u. impedance. Expressed mathematically it is:

$$I_s = I \div Z$$

This value is the symmetrical current, but for the selection of devices with adequate capacity it is necessary that the total current be considered.

Total short-circuit current is made

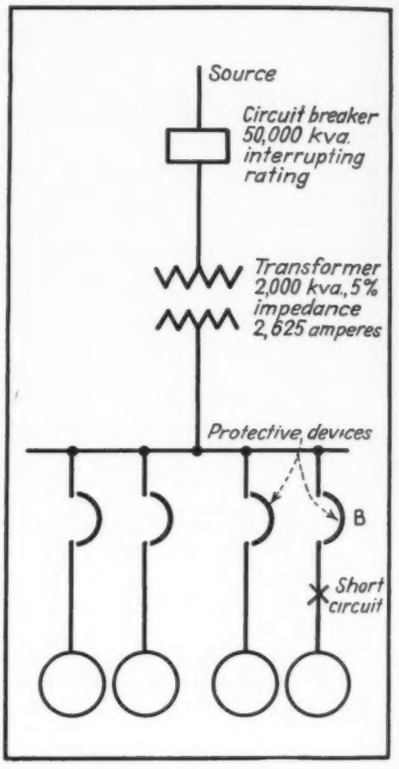


Figure 2. On a short circuit, protective device *B* must interrupt current from the transformer plus the inrush from all motors feeding into the fault at *B*

Table I. Approximate Values for Subtransient Impedance of Low-Voltage A.C. Rotating Apparatus

Machine	*Subtransient Reactance, P.u. Values*	
	Range	*Mean**
Small turbo-generators		
625–4,375 kva	0.07–0.12	0.09
Salient-pole generators with amortisseurs		
12 or fewer poles	0.10–0.25	0.18
14 or more poles	0.18–0.40	0.24
Salient-pole generators without amortisseurs		
12 or fewer poles	0.15–0.35	0.25
14 or more poles	0.25–0.45	0.35
Synchronous motors (general purpose and motor-generator sets)		
6 pole	0.07–0.16	0.10
8–14 poles (incl.)	0.11–0.22	0.15
Induction motors	0.115–0.303	0.165

*For close calculations get specific data for the apparatus in question. Where ranges of data are given, it is expected that selections will be made within the range that exemplifies the case in hand. The mean value should be used only when very little is known about a particular machine.

Table II. Typical P.u. Values of Impedance of Single-Phase Power Transformers*

Single-Phase Transformer Kva.	*Primary Volts*	*Impedance, P.u. Value*
100 and below	4,800 and below	0.028 –0.035
	6,900–13,800	0.03 –0.05
	22,000–34,500	0.0525–0.065
150–500	4,800 and below	0.035 –0.045
	6,900–13,800	0.041 –0.05
	22,000–34,500	0.0525–0.065
	66,000	0.065 –0.075
667–1250	25,000 and below	0.055 –0.06

*With secondaries rated 600 volts or less.

Inability of the main circuit breaker, on the wall at the left, to interrupt the maximum current that could be developed on a short circuit might easily spell disaster to this metal working shop

up of an a.c. component (frequently referred to as the symmetrical current) and a d.c. component. This is illustrated in Figure 1 where the wave to the left of *OY* represents the current previous to the fault and the wave to the right, the short-circuit current. Let current *AB* represent the d.c. component, with *CD* and *EF* the envelopes of the peak values of the total current. The d.c. component has the effect of offsetting the total wave by the amount shown by *AB*. After a time the d.c. component dies down and leaves only the a.c. component, which is symmetrical with respect to the X axis. During the existence of the d.c. offset the total root-mean-square value (represented by curve *RT*) is greater than the root-mean-square symmetrical value, and this increase depends upon many factors.

For low-voltage a.c. circuits a factor of 1.25 times the symmetrical value may be reasonably taken as representing the three-phase average conditions at an instant ½ cycle after the short circuit occurs. NEMA has adopted this practice as standard for the application of air circuit breakers.

The total short-circuit current (average of three phases) is then:

$$I_{sc} = 1.25\, I \div Z$$

Equation 3.

As previously stated, the value of Z is the total impedance all the way back to and including the generators. Since such data are not always available, certain approximations have to be made.

The most common application of low-voltage switching devices in industrial installations occurs in systems served by power transformers. In such secondary circuit applications the characteristics of the system back of the transformers are usually not known. Hence it is frequently the practice to assume the transformers as the source, on the assumption that the primary voltage is maintained constant even during short circuits in the secondary lines.

This assumption is based on unlimited power being available at the primary terminals and naturally results in the maximum possible short-circuit in the secondary. It may, consequently, result in the selection of devices of higher interrupting capacities than are really required. If the source of primary power is limited to such an extent that a short circuit in the secondary causes a drop in the primary voltage it is obvious that the magnitude of a short-circuit current will be less than in the case of unlimited power.

Interrupting rating required for the primary power circuit breaker is a convenient base to start on. This information is always available even though the system characteristics back of the transformer are not known. Thus, if a power circuit breaker having an interrupting rating of 50,000 kilovolt-amperes for example is adequate for the primary, it may be assumed that the limit of power does not exceed 50,000 kilovolt-amperes. This value is then taken as the base upon which to compute the magnitude of the secondary short-circuit current.

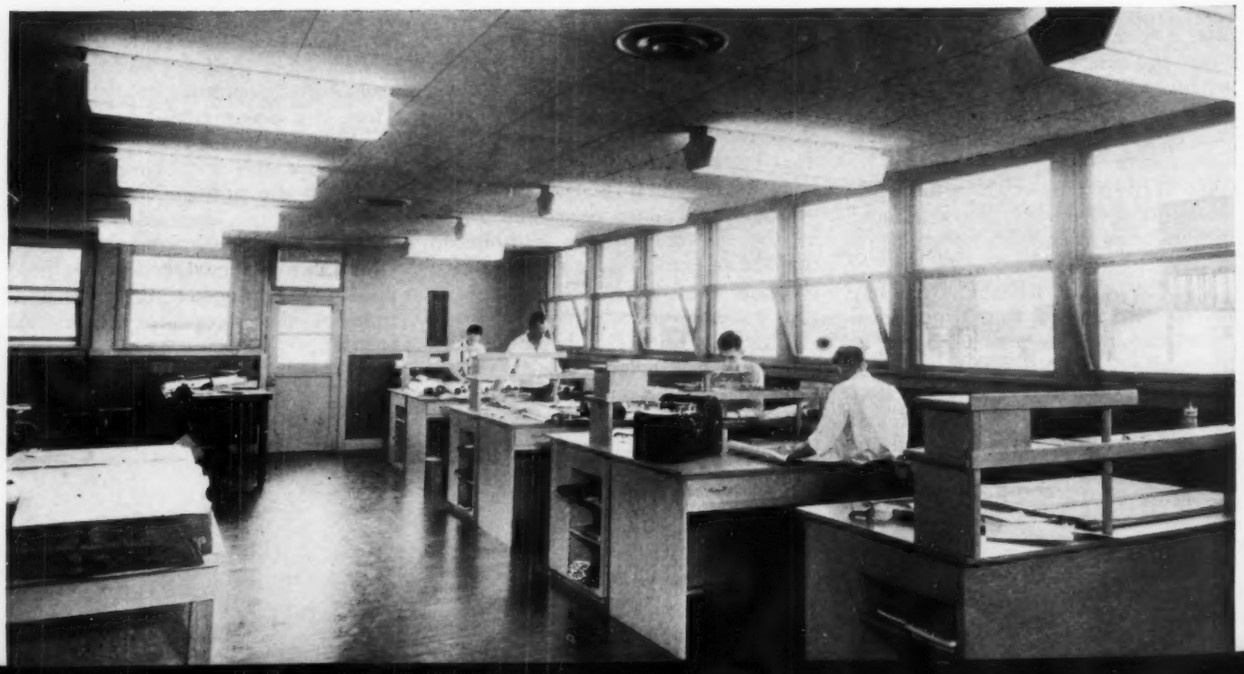
(The second installment of Mr. Holland's article will be published in an early issue.)

Good daylight, light-reflecting walls, efficient indirect lighting, and plenty of fresh air help designers in the Bendix Aviation, Ltd., Burbank, Calif., plant to do their bit toward national defense

Offices Are Important, Too

Plenty of attention is being given to the working conditions on production floors. An equal amount of care and consideration should be shown to employees in engineering and factory offices. They're doing their part, too

No darkness at Timber Structures, Inc., Portland, Ore. Walls are practically all windows, and fluorescent lighting takes care of gloomy days. Drafting tables and boards are specially designed



"Islands" of clear glass in the glass block windows keep claustrophobia sufferers from feeling shut in. Top of 4-drawer filing cabinet is standard height for all window sills, so that no windows can be blocked by office furniture

Three hundred people work in the drafting room at Westinghouse Steam Division Works, Lester, Pa. There's no lack of light—nearly one-third of a mile of fluorescent lamps provide glareless, shadowless illumination, and air conditioning keeps fresh air cool in summer and warm in winter

(CONTINUED ON NEXT PAGE)

Offices Are Important, Too (continued)

Photograph by courtesy of The Austin Company

"Controlled conditions" are a feature of the offices of All-Steel-Equip Company, Aurora, Ill. Fluorescent tubes in continuous ceiling troughs give even light. Air conditioning ducts are concealed above the acoustic ceiling. Photographic murals add interest to the windowless walls

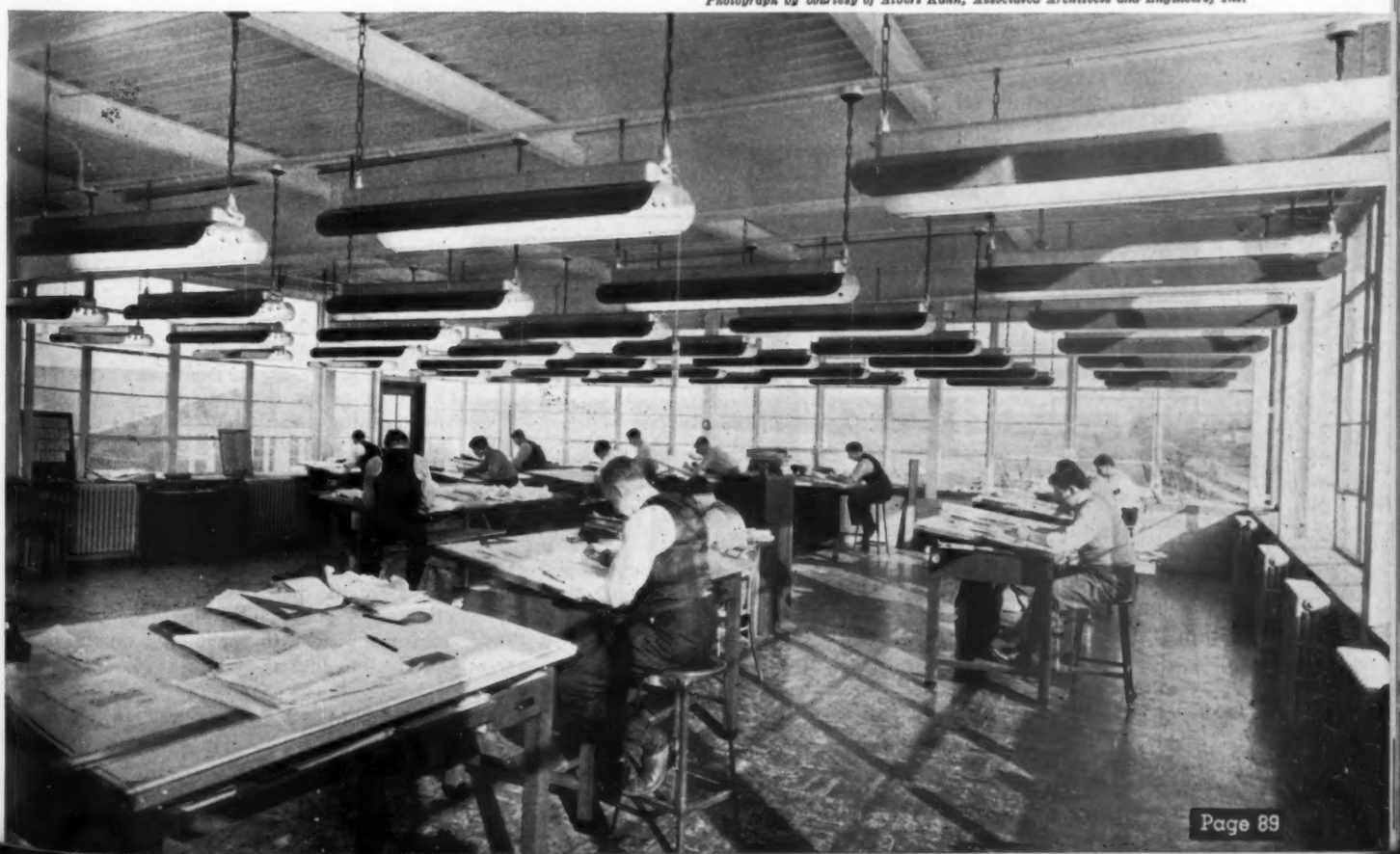
Designed for efficiency is the drafting room at the Goodyear Aircraft factory, Akron. Plenty of daylight, walls and ceilings that take advantage of all reflective possibilities, indirect artificial lighting, all add to eye comfort. Work under pressure makes best care of employee health of utmost importance

Photograph by courtesy of H. K. Ferguson, Inc.

Good light by day or night (glass blocks and fluorescent lamps), quiet and comfortable surroundings (asphalt tile, acoustic ceiling, and conditioned air) make pleasant working conditions for engineers and draftsmen in the precision machine shop offices of Marmon-Herrington Company, Indianapolis

Spaciousness and airiness feature the cheerful sun-lit drafting room at Taylorcraft Aviation Corporation, Alliance, Ohio. Fluorescent lighting gives fine night or dark-day illumination, and the asphalt tile floor does its own decorative part toward making this office one in which men may enjoy their work

Photograph by courtesy of Albert Kahn, Associated Architects and Engineers, Inc.



Day-and-Night Maintenance

Change-over to 168-hour operation brings new production headaches. Cure is 168-hour maintenance. How a 236-man department is organized and run

LAWRENCE TEARE, Superintendent of Maintenance, Thompson Products, Inc., Cleveland

Four cents an hour was the going wage when Lawrence Teare began his career as apprentice machinist in 1903. But he rose to 12 cents for his year as "senior" apprentice. Followed several years devoted to studying, drafting, tool and die making—in fact, anything in factories. With Thompson Products almost 25 years, he has spent all but a month of that time in his present position—superintendent of maintenance

PLANT EXPANSION—we have added to our main factory, bought two new buildings, and leased several other factory properties during the last three years—has presented many problems to our maintenance department, and more than doubled its work. Approximately 800,000 square feet of floor space is now devoted to factory buildings owned or operated by Thompson Products—practically every square foot occupied by production machinery. The maintenance department is responsible for the complete maintenance of all buildings, power lines, heating, and lighting, as well as the upkeep of manufacturing facilities.

Every time a new building was acquired the maintenance department moved in first, to revamp, remodel, and refit the building for the production purpose for which it had been obtained. In some instances we supervised laying entire new floors, changed over the power and distribution systems, repaired the roof, installed elevators, put up partitions, and completely remodeled the building.

Only when machines are set up and the power is turned on, is the first job of the maintenance department completed. From then on we are responsible for the maintenance of the building and equipment so that production can continue 24 hours a day, 6 or 7 days a week.

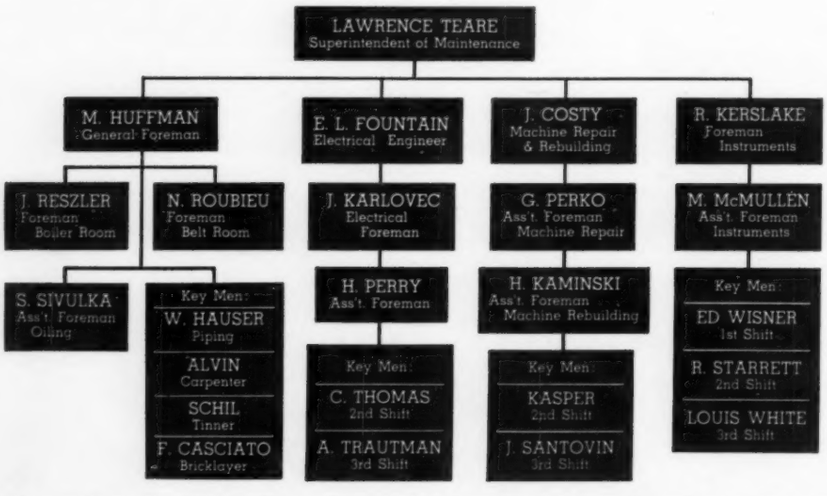
Plant housekeeping is one of our important concerns—upkeep of safety and fire prevention equipment, sprinkler system, valves, pumps, hydrants, extinguishers, pipes, windows, stairways, entrances, exits, firedoors, elevators. Cleaning, painting, heating, carpentry, bricklaying, tinning, plumbing—everything that has to do with keeping the physical property in shape for uninterrupted production, is our job.

In 1938 several departments went from one- to two-shift, then to three-shift, operation. Early in 1940 all other departments followed suit, so that we have now been on a three-shift basis throughout the plant for a year and a half. This change, gradual at first but rapidly accelerating, has brought many new problems, and rendered all our problems more acute.

During the past three years, because of the acquisition of new factory space and the changes in plans occasioned by new developments in national defense, it has been necessary to move practically every machine at least once, and in some instances several times. This, of course, has meant a new load on the maintenance department. Every time a machine is re-located, it means electrical work, sometimes new floors, and always new power distribution.

Departments in the plant that run only six days a week offer no serious problem in machine repairs. We can go in on Sunday. But where the operations are on a 7-day basis, we have to repair the machine on the floor during operating time. We get all the new parts ready to install, so that the time lost while the machine is being repaired is inconsequential.

When a machine requires rebuilding, we move it off the floor, take it to our rebuilding department where we have the parts ready for installation, and rush it through this procedure in order to get it back on the production line as quickly as possible.



Organization charts of maintenance department at Thompson Products. Part of the key man's job is training new employees

A large crew spends its entire time doing nothing but rebuild machines.

Operators are trained to report the failure of any machine to their foreman, who notifies the maintenance department. In a few minutes there is a repairman on the job.

Every maintenance department is accustomed to "taking advantage of the breaks," but in 7-day, 24-hour operation there are no "breaks"—even between shifts. We have to make our own breaks and we have found that resourcefulness (which is the maintenance man's middle name) will usually find the answer to any puzzle. The present urgency in production has pulled many a maintenance man out of a rut by taxing his resourcefulness to the limit.

Oiling goes on all the time without stopping machines. Specially trained men follow standardized instructions, keeping all machines well oiled. This is vital in high-speed production. Formerly operators oiled their own machines, and each operator had a different idea of the amount of oil that should be used, and how often the machine should be oiled. Now the operator attends only to production.

Greasing a machine requires only a few minutes—about long enough for the operator to go to the drinking fountain and back—therefore the time lost in greasing is inconsiderable.

No Burnouts

Lubrication men are on duty throughout the three shifts, so there is no reason for burnt-out bearings or other troubles caused by careless or forgotten lubrication.

We are gradually changing over from incandescent to fluorescent lighting, and increasing the foot-candles of illumination as rapidly as new floor space is opened up for production. The lamps are looked after carefully, and when the foot-candle meter shows a diminution of lumen output, the causes are immediately investigated and new lamps, and in some instances new units, are installed.

We have white ceilings and white walls throughout our plants, excepting for the first 8 feet from the floor, which we have painted black for the practical reason that the walls become soiled up to the height that men can reach, and black looks better than white where grease and oil spots show. Also, we believe that the black walls up to and above eye level are a little easier on the eyes.

The personnel in the maintenance department has more than doubled since 1938. A complete analysis of the manpower engaged in maintenance work at present shows 8 carpenters; 25 oilers, 2 painters, 11 electricians; 13 electrical helpers; 5 tinners; 3 beltmen; 4 bricklayers; 10 millwrights; 19 millwright helpers; 5 pipefitters; 5 pipefitter helpers; 82 machine repairmen; 40 machine rebuilders; 4 elevator operators—a total of 236.

A factor that has simplified our manpower problem to some extent, lies in the fact that we have never regarded a maintenance man as a jack-of-all trades. We have never expected a man to be able to handle any kind of maintenance work, but used a specialist system constantly, hiring experienced men in the skilled labor occupations, and assigning to them work for which they have been specially trained.

Therefore our personnel problem has been reduced to the question: "*Where can we find the men we need for these special types of work?*"

Our answer has been—"*Train them.*" Of course we do not attempt to train carpenters, bricklayers, painters, or electricians. But we can train helpers for pipefitters, millwrights, electricians, and machine repairmen. Our method is simple, and is based upon the new "learner concept." We cannot wait four years for an apprentice to complete his training. Therefore we place a new employee with a veteran and let the veteran teach him the work. When the new man knows enough about the work to carry his own tools, we have another mechanic, who can teach the next new man.

A small number of "key" men thus form the nucleus for a continuous training program, which grows as the production requires. This plan has proved its effectiveness during the past three years when our personnel has steadily increased. It has enabled us to keep step with production.

Sometimes the resourcefulness of our men has been severely taxed, but the urgency of our problems has compelled us to study our work as we never have before. Many changes that might otherwise have taken years to complete have been accomplished, under the necessity for speedy action, in a much shorter time.

In fact, it is evident that maintenance work is more important, under present conditions, than it has ever been before. There is little danger of getting into a rut or slowing down our efforts to keep the wheels moving faster and faster, so that we can help to turn out the vast amount of production needed to fill the growing requirements of national safety and essential aviation needs.

Machines that require rebuilding are moved into the rebuilding department, where a large crew works all the time. Parts are ready to be installed, machine is rushed back into production

New assembly floor is composed of 16 cast-steel plates supported on heavy I-beams on a concrete base

Unique Floor Speeds Erection

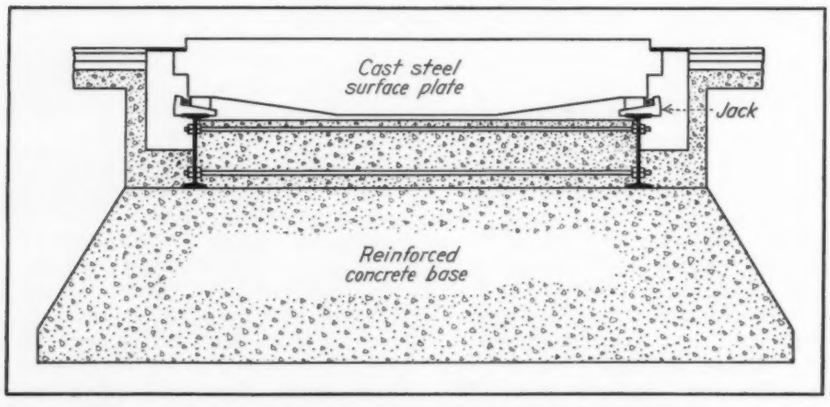
Built of massive plates, easily leveled, it avoids need of shimming up large, heavy section while assembling complete units, which range from 40 to 50 feet in length

An erection floor unique in size and construction has been built into an addition at the plant of the American Electric Fusion Corporation, Chicago. This company manufactures tube mills, which consist of several sections that when assembled make units ranging from 40 to 50 feet in length.

It is necessary that the sections which form these tube mills be assembled in perfect alignment. That requirement in turn makes it necessary to erect the mills on a surface that is plane within very close limits. The extreme weight of the sections made it difficult to obtain these conditions as fully as was desired, on the erection floor used formerly. In consequence, it was often necessary to resort to shimming, in order to secure exact alignment of the sections. Although satisfactory results were obtained in this way it was a slow process, and, therefore, increased the time required for erection to an undesirable extent.

Need for more space prompted the decision to build a three-story structure at one end of the plant. It is 50 feet wide by 125 feet deep. A second addition at the east end of the plant is now under construction.

First-floor space on one side of the first addition has been fitted up as an assembly room for tube mills. It was realized that the erection floor, which is 64 feet long and 8 feet wide, would have to be of unusually heavy construction. Therefore, it was laid down on a base of reinforced concrete 6 feet thick. As will be seen from the drawing, two 15-in. I-beams, each 6 feet long, were embedded in concrete on top of the base. The surface on which the tube mills rest during erection is composed of 16 cast-steel plates, each 8 feet long, 4 feet wide, and 14 inches thick. The upper surface of the plates was planed smooth and true. These plates rest on the two I-beams and can be brought to exact level and kept there by means of four jacks, one at each corner. Now when erecting mills on these plates it is never necessary to use shims in order to get proper alignment. It is estimated that the resultant saving in time will amount to a considerable item on each mill.



A jack at each corner of the steel plates keeps all plates level

By conserving strategic materials, the maintenance department can make a real contribution to defense

Make Rubber Belts Last Longer

Secret is to apply properly, don't abuse, protect from harmful influences. It's a good way to make supplies of a valuable material go farther, and keep costs down

PAUL D. SULOFF, Mechanical Goods Development, The Goodyear Tire & Rubber Company, Akron

THE RUBBER and the cotton fabric portions of rubber belting are vulnerable to certain hazards, both in storage and in use. What these hazards are and how they can most easily be avoided, will be discussed in this and a succeeding article.

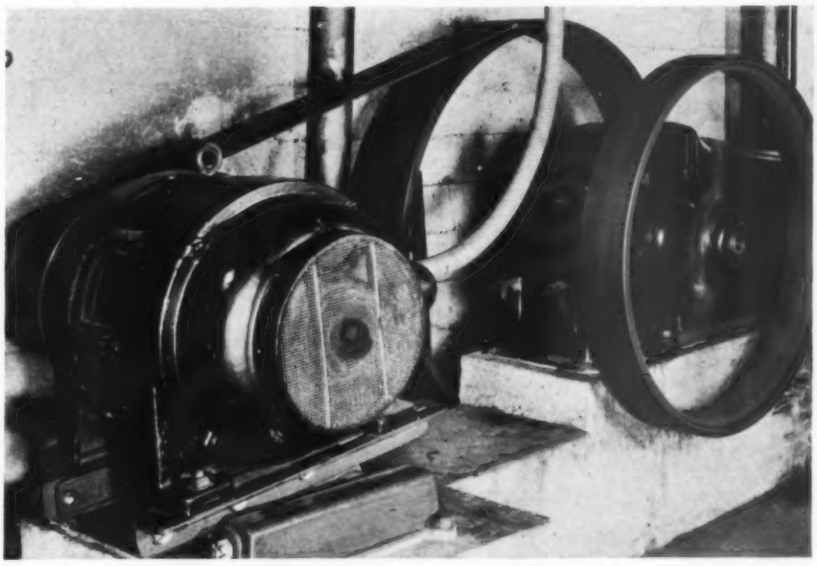
To conserve belting in storage it is necessary to retard aging of the rubber compound and to protect both rubber and cotton from harmful external influences. Heat, sunlight, and oil are likely to be the most common harmful influences acting on the rubber compound.

Avoid Mildew

Cotton duck is subject to deterioration as a result of mildew, which may need no help other than proper moisture and temperature, or by drip from processes using acid or caustic solutions. There is some use of compounding ingredients to discourage the growth of mildew on the duck so that it is not always a hazard. In many instances it is a distinct possibility, however, and the conditions promoting mildew growth should be avoided. Belts in storage should therefore be cool, not exposed to sunlight, dry, and protected from dirt, oil, and drip of all kinds.

Proper selection of size, ply, and type of belting for a given set of conditions is of prime importance in obtaining maximum belt life. Likewise, the drive conditions can in many applications be varied to give vastly improved belt life. The chart shows graphically how important an effect the various drive influences have on the flexing life of the belt. Belt tension, pulley diameter, and belt thickness, it will be noted, have far greater effect than casual experience would lead one to expect.

To give proper weight to these various factors in selecting a belt for a given set of conditions, requires some calculation. To simplify this matter for the user, belt horsepower rating tables are available in which the horsepower rating is varied with pulley size, belt speed, number of plies, and with the type of belt. Thus the major factors affecting flex life are compensated for in the horsepower. Therefore a reliable table of such ratings should be used to select the proper type, ply, and size of belting for a given set of operating and service conditions.



Pivoted motor bases are an effective means of keeping belt tension at the proper value, under all load conditions. This belt operates on a 64-in. center, transmits 60 horsepower

Knowledge of the characteristics of the common types of rubber belting is helpful in indicating the general purpose for which each is intended.

Cord transmission belting is made in two types, known as large cord and tire cord. The large cord belting has a single layer of cord incased in a fabric envelope. These belts are made in numerous weights with cords ranging from 0.05- to 0.25-in. diameter.

This type of belt has the best flexing life and lowest stretch available. It is made by winding a single or double helix of cord around two pulleys or a drum, and is therefore truly endless. Where endless application is difficult or impossible this belting can be spliced in the field by using portable electric vulcanizing equipment. There is an increasing use of this type of belt in connection with pivoted motor bases for control of

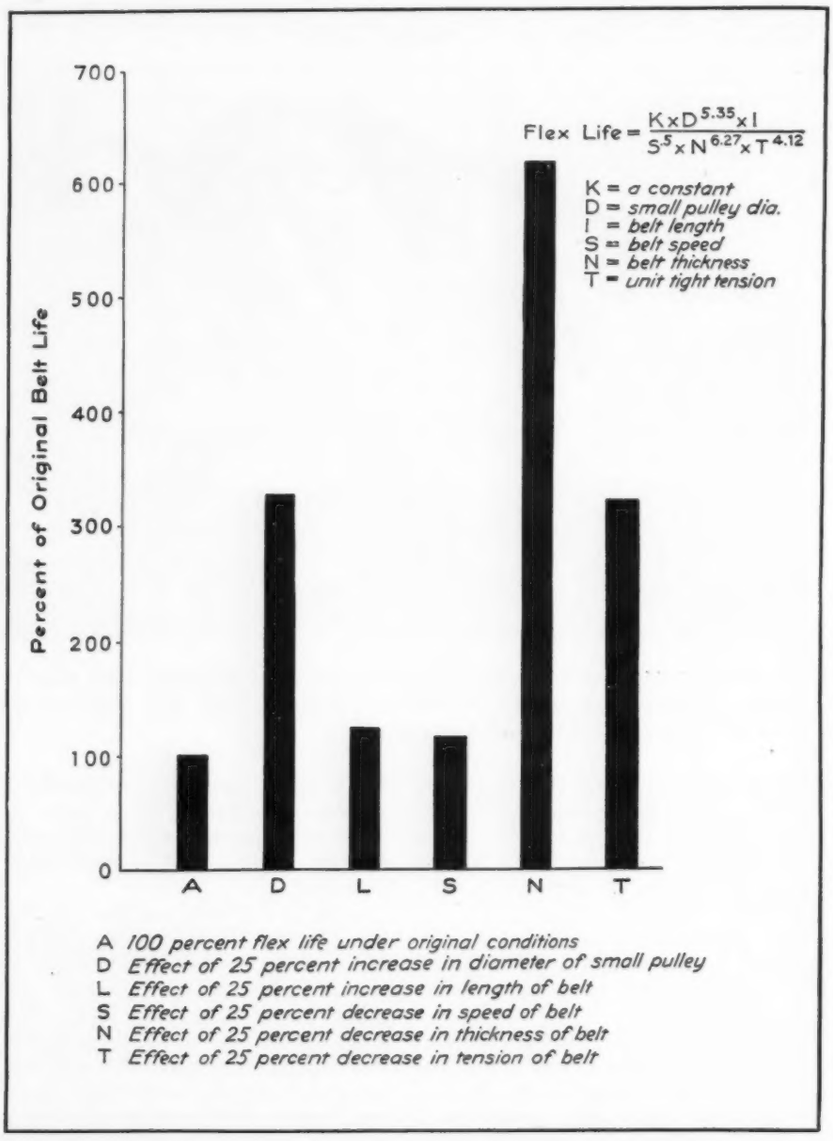
tension. Such a combination makes an economical, trouble-free drive. Experience with endless cord belting has led many users to go to considerable expense in tearing down machines to install endless belts, because they know that the cost involved will be repaid many times in long, dependable belt life.

Tire cord belting is made up of several layers of small cords usually 0.028 to 0.030 inches in diameter. These cords are laid in plies and the belt is in that respect similar to the fabric type. A fabric envelope incases the cords. This type of belting is low in stretch and high in flex life, although it is usually not equal to the single-layer, large-cord variety. It is made endless or can be spliced endless in the field. Fasteners have not proved satisfactory in this or in large cord belting, except in a somewhat limited field.

Various weights of duck, ranging from 8 ounce to 36 ounce, are used in fabric transmission belts. The 28-, 32-, and 35-oz. ducks are most commonly used. The nature of the duck affects the strength, stretch, ability to hold fasteners, and resistance to edge wear of the belt. Flexing life of the belt is affected by the nature, amount, and placement of the rubber compound. Fabric belts of higher quality usually carry an additional amount of rubber compound in the form of a skim coating, which is an additional lamination of compound between plies, laid on each ply after the friction impregnation. In most instances this coating multiplies the flexing life several times. Lower-quality belts have less flex life, but are entirely suitable in drives where flexing is likely to be less frequent and severe.

The major portion of fabric rubber belting is installed with mechanical fasteners on fixed-center drives. While it is common practice to use factory-made endless or field-vulcanized endless fabric belts, it will usually be found more satisfactory to use the endless cord belt for such drives. In this connection the term endless should properly be associated with the cord-type belting, both because of its construction and its performance.

As shown in the chart, belt tension is a fourth-power factor in flexing life. For this reason it is important that tension be controlled. The use of pivoted motor bases for maintaining and controlling belt tension is highly recommended. Such bases with a properly located pivot point automatically proportion the belt tension to the load and thus eliminate the need of running the belt continuously tight enough to handle peak loads, which may be short and infrequent. This device is not only a belt conserver of the first importance, but in addition makes appreciable power and maintenance savings.

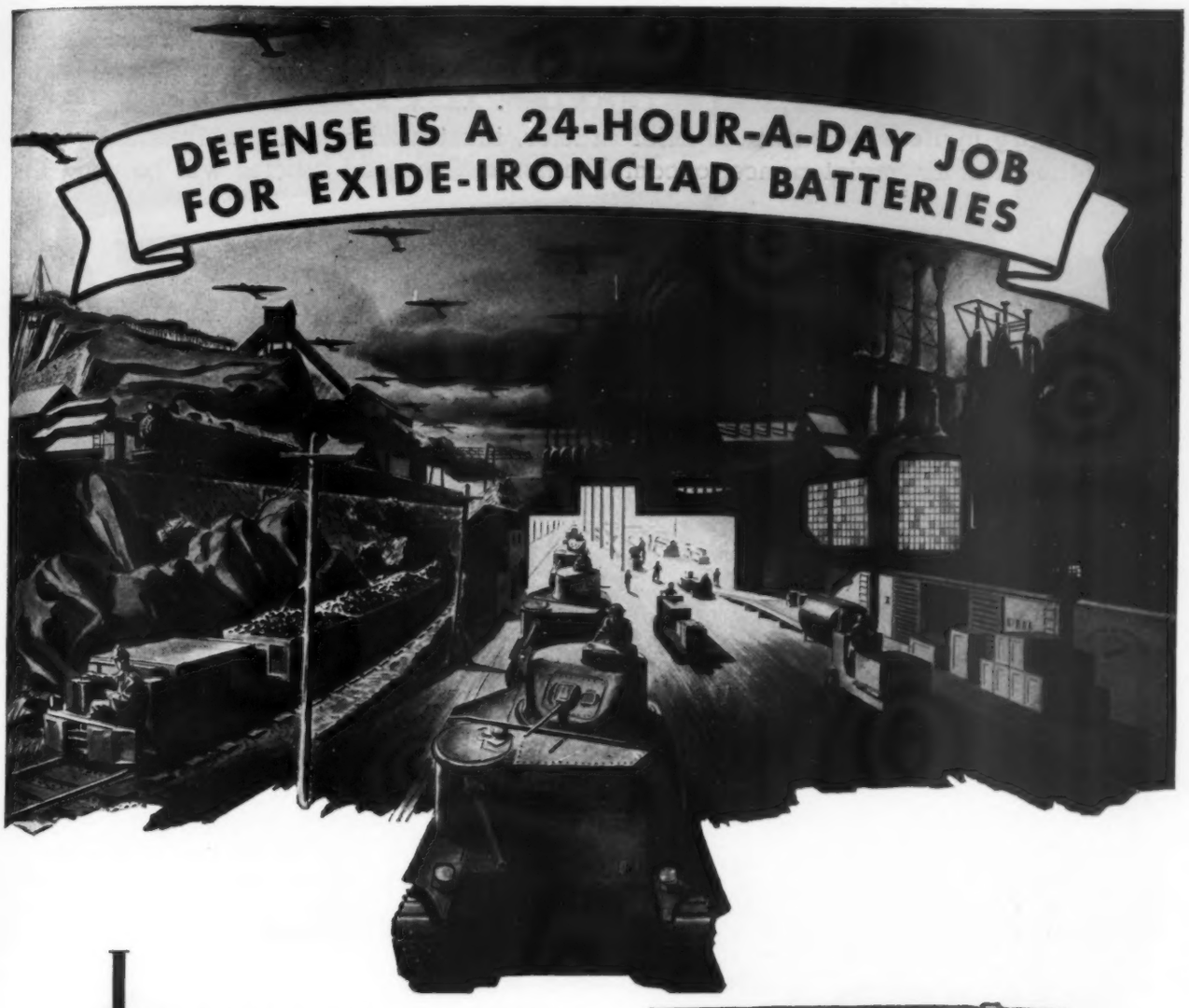

Flex Life = $\frac{K \times D^{5.35} \times I}{S^5 \times N^{6.27} \times T^{4.12}}$
K = a constant
D = small pulley dia.
I = belt length
S = belt speed
N = belt thickness
T = unit tight tension
Percent of Original Belt Life
700
600
500
400
300
200
100
0
A
D
L
S
N
T
A 100 percent flex life under original conditions
D Effect of 25 percent increase in diameter of small pulley
L Effect of 25 percent increase in length of belt
S Effect of 25 percent decrease in speed of belt
N Effect of 25 percent decrease in thickness of belt
T Effect of 25 percent decrease in tension of belt

This chart shows the result of a favorable 25 percent change in each of the factors that affect the flexing life of a rubber belt

Tension Unknown

On fixed-center drives the tension is not usually known. Large belts can be installed, using tension balances to indicate when the proper tension is obtained. On smaller drives the time required to measure tension does not seem to be justified, and the usual practice is to cut belts short a percentage of their length. The figure most commonly used for this purpose is 1 percent or $\frac{1}{8}$ inch per foot. In some instances less take-out is sufficient, while in a few underbelted drives more is required. Determining the amount of take-out is mainly a matter of experiment, but the object of the experiment should be to find out the smallest value of tension that will be satisfactory without creating too many refastening jobs.

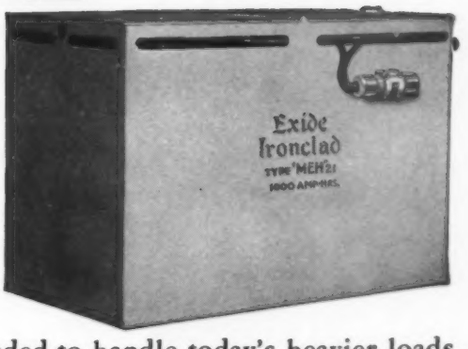
(The effect of oil and other influences and conditions harmful to rubber belts will be considered in a succeeding article, to be published in an early issue.)



IN busy defense plants, steel mills and shipyards where electric industrial trucks run tirelessly night and day, Exide-Ironclad Batteries are on the job . . . speeding up *production* by speeding the flow of materials, freight and cargo.

Production lines slow up and stall if materials aren't fed to them on time. Dependable Exide-Ironclads in battery electric trucks help to assure the prompt delivery of essential materials within each factory and steel mill, and at terminal, dock and warehouse.

Exide-Ironclad Batteries have been specified for this important 24-hour-a-day defense job because they supply the surging power



needed to handle today's heavier loads . . . and they deliver this power at a consistently high voltage for faster running speeds.

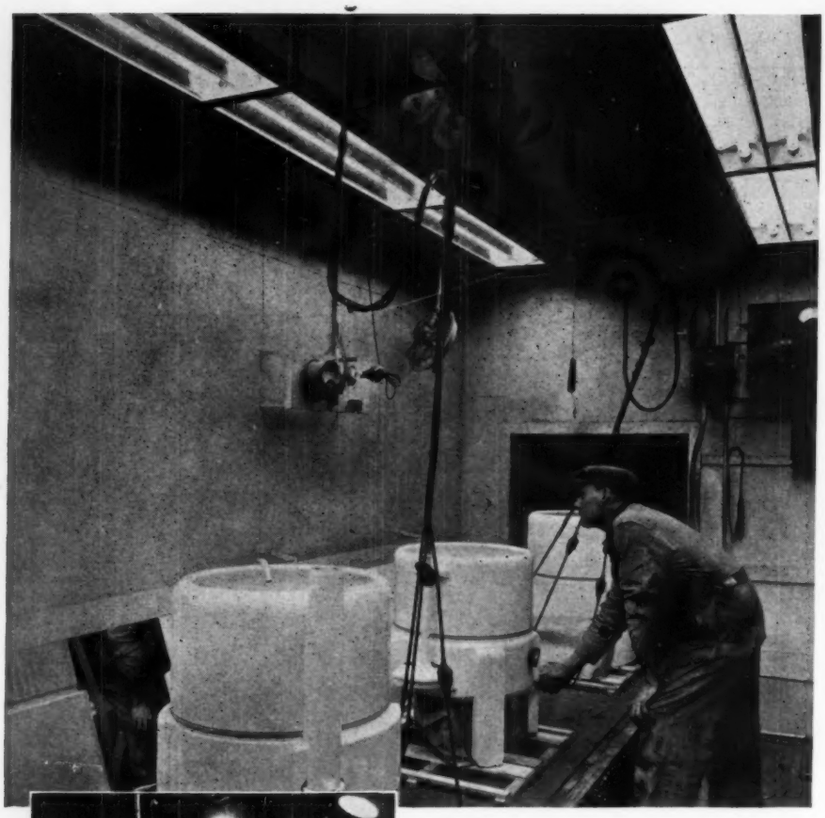
Best of all, Exide-Ironclads are so easy to maintain and so dependable that they are helping to prevent breakdowns and delays . . . they're doing their part to keep America rolling!

Exide IRONCLAD BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

MAINTENANCE SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary maintenance accomplishments. Accepted articles will be paid for



Substitution of fluorescent luminaires for incandescent lamps in this inspection booth doubled intensity of illumination without increasing power costs. Glare, radiant heat, shadows formerly annoying to inspectors were eliminated

Better Light, Same Power Costs

SOURCE—Westinghouse Electric & Manufacturing Company, East Pittsburgh

The two accompanying photographs illustrate the high efficiencies possessed by fluorescent lamps and demonstrate what striking improvements can be made in illumination of important areas without increasing power costs. The smaller photograph shows one of the inspection booths in the plant of the Apex Electric & Manufacturing Company, Cleveland, before it was relighted. Six reflectors, each equipped with a 200-watt daylight incandescent lamp, provided about 50 foot-candles of illumination on the inspection line. Lamp brightness of these units was high, causing annoying direct and reflected glare; and the amount of heat radiated by them caused discomfort.

After relighting with fluorescent, the same inspection booth takes on the cheerful brightness that is so apparent in the larger photograph. Six twin lamp luminaires, each utilizing two 48-in. 40-watt fluorescent lamps, provide 100 foot-candles of cool, glareless illumination. Especially noticeable is the absence of shadows in any form on the product being inspected, and the evenness of illumination over the entire booth. Direct and reflected glare has been eliminated, and radiant heat is no longer annoying to the workers.

Welded Part Prevents Shutdown

SOURCE—Hobart Brothers, Troy, Ohio

When the casting broke supporting the lifting mechanism and top roller weighing 40 tons on a huge 30-ft. plate roller at the Ingalls Shipyard in Pascagoula, Miss., it was found that a new cast-iron casting could not be obtained for several months. To prevent a long shutdown, an all-welded part was constructed from 1¼-in. steel plate.

The new arc-welded part was constructed in five days at only a fraction of the shutdown cost that waiting for an iron casting would have necessitated. It is said that the new welded part is much stronger than the old one with more flexibility and resistance to stress.

•

Food products manufacturer corrected power factor in his plant and was granted a reduction in demand and energy rates by the power company. Result: he made a saving of $16,000 a year.

•

Safeguards for High-Pressure-Process Gages

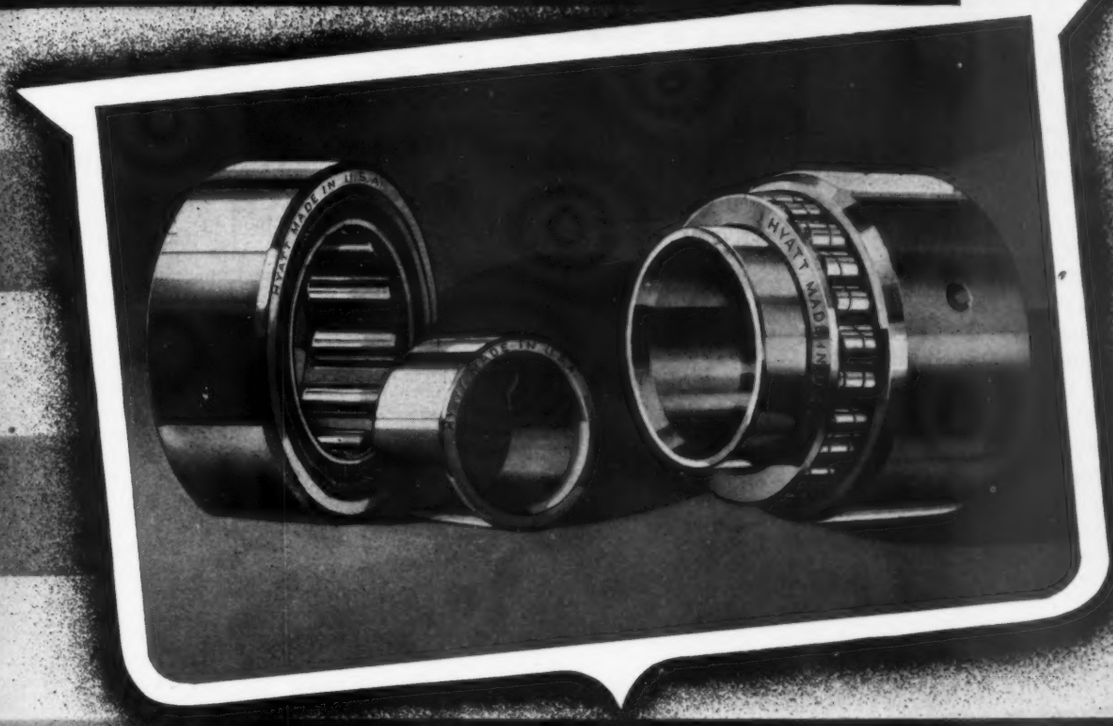
S. H. COLEMAN, Roanoke, Va.

Ordinary bourdon tube gages must be designed with special care when used in high-pressure processes. Numerous accidents have resulted from the rupture of bourdon tubes attended by violent disintegration of gage casings. In many laboratories, gages used in working out high-pressure technique are mounted behind sheet-steel guards and are read by means of a mirror arrangement.

To safeguard these gages every precaution must be taken to prevent the casing from being subjected to excessive pressures. Oil seals should be provided to prevent internal corrosion of the tube; the gage should be throttled down to prevent fatigue due to pulsating pressures; and a built-in throttling or check device provided to prevent too rapid rise and fall of pressure.

Gage casings must also be vented—as by boring a large number of small holes in the case. Where there is danger of the bourdon tube and other working parts of the gage becoming corroded by breathing action in corrosive atmospheres, use of

KEEP THEM GOING WITH HYATTS

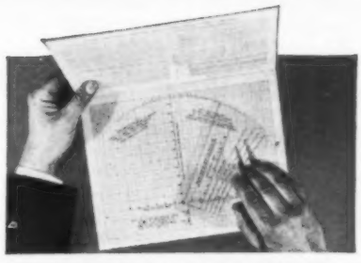


NO MATTER WHAT THE APPLICATION

Precision built... great in capacity... Hyatts are helping to lighten the loads of all mechanized defense equipment.

Meanwhile, Hyatts still are serving in their regular, and now more essential than ever, role of keeping free from bearing wear and care the machinery which produces this defense equipment.

Therefore remember, today as always, that where the loads are heavy and the going is tough you can depend on Hyatt Roller Bearings for any application.



FREE TO MACHINE DESIGNERS

HYATT GEAR THRUST CALCULATOR — valuable timesaver for designers and engineers. Request in writing on your company letterhead—address Sales Department, Hyatt Bearings Division, General Motors Sales Corporation, Harrison, N. J.

HYATT

ROLLER BEARINGS

QUIET

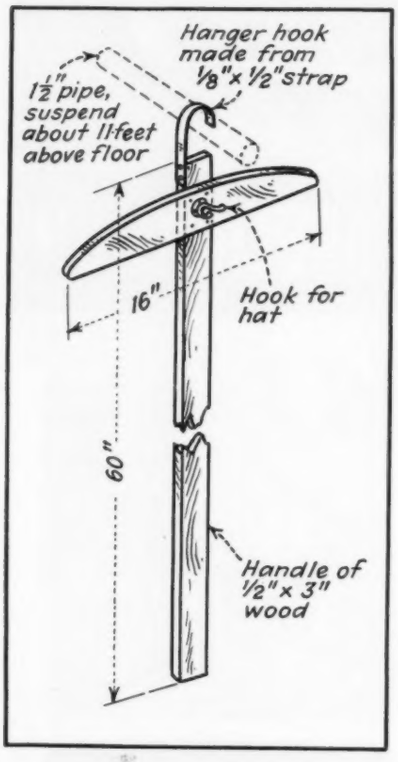
unprotected vents in the case should be avoided and large openings, provided with lids held in place by low-tension springs, substituted.

Wherever possible, gage glass should be removed and the gage face left open. Otherwise safety glass or thin transparent plastic sheeting should be substituted for the glass to minimize danger from flying particles should a rupture occur.

•

One company, in order to save space, mounted two battery-charging units for a fleet of electric trucks one on top of the other. The base of the bottom set is so arranged that the unit may be easily removed for maintenance work.

•



Hanger Stores Clothing Up Out of the Way

DAVID BAUM, Portsmouth, Ohio

Confronted with the problem of providing his male employees with space for hanging their hats and coats, one small plant owner nicely solved the problem and still saved his valuable floor space.

A number of special coat hangers were made as detailed in the accompanying sketch. A length of pipe was suspended from the ceiling and provided a means of holding the hangers, laden with clothes, up and out of the way when not in use. The handle on the hanger provided a means for both lowering an empty hanger and then lifting the loaded hanger back up to the pipe.

•

With Free-Blow Valve With Free-Blow Valve

H. C. SLEMAN, New York

Where continuity of condensate drainage service is a necessity some means of passing must be provided so that the trap can be taken out of service for inspection or maintenance. With the usual form of bypass valve installed in steam trap piping connections, however, there is always the danger of the valve being opened either accidentally or intentionally and left in this position for long periods of time. When this happens an enormous quantity of steam is likely to be wasted.

Wherever traps discharge into return lines operating at pressures ranging from atmospheric upward, the old type of bypass is best dispensed with and a free-blow connection used in its place. When traps are hooked up in this manner, condensate waste will occur only when an individual trap is removed from service. Any bypassing of waste during normal operation of the equipment is improbable since the open features of the free-blow drain will enable the immediate detection of any leakage.

•

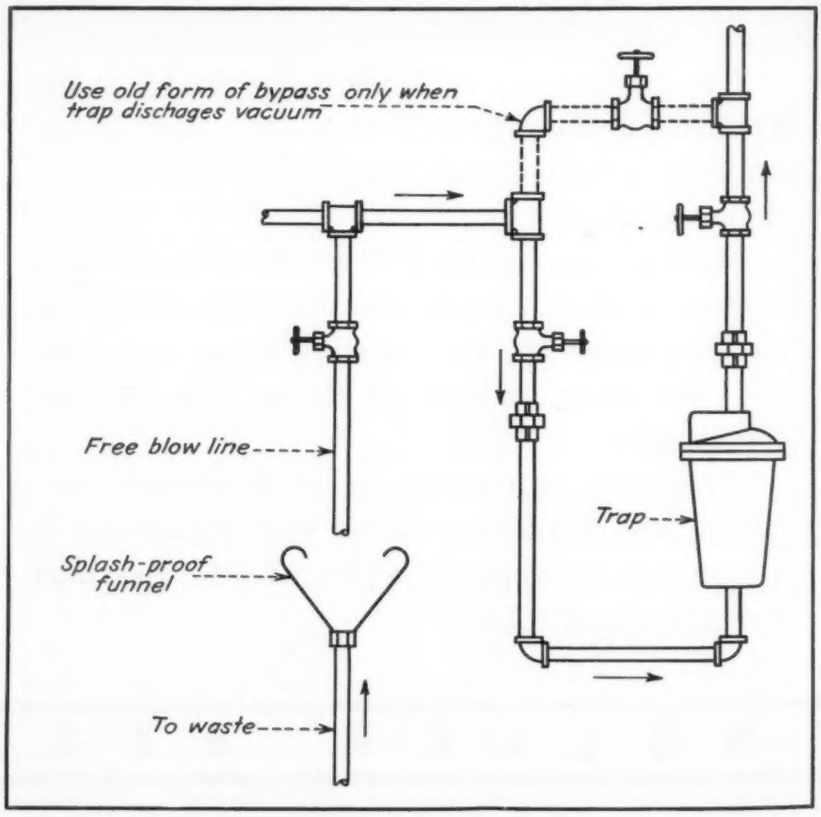
Keep Stockpiles Small and Well Separated

"If you've got a lot of material piled up in one place in your plant, it is all likely to burn in a fire. Put the storage in well-separated buildings or stockpiles so that a fire can destroy only a small amount."

This warning has been issued by Lewis E. MacBrayne, New England Director for the National Committee for the Conservation of Manpower in Defense Industries. It was prompted by a recent fire in a New England plant, caused by a disregarded hazard, that destroyed five buildings out of twelve and ruined one-tenth of the government's rubber stock reserve for national defense. Continuing, he advised:

"In general, don't wait for outside agencies to tell you about such conditions. Inspectors and surveyors of insurance and government agencies, for example, are plenty busy right now. It takes time to get around on inspections and work out corrective measures for fire hazards.

"If you're patting yourself on the back and saying: 'It can't happen in my plant,'



A free-blow bypass for traps helps to prevent waste of steam

Strain and speed are hardest to handle *at the turns* in PIPING, too!

On a bobsled run, constant danger lies at the banked turns. Here the utmost skill of the driver and braker are required to avert an accident. (*I.N.S. photo*).

Insure safer, stronger, trouble-free piping systems with TUBE-TURN welding fittings

When the fluids or gases in your piping systems zoom through the lines and swerve into the turns—*added* strain and friction strike the fittings and joints. Trouble usually develops here *first* in any piping system *because the most danger lies at the turns!*

Weld with TUBE-TURN fittings and *your* plant piping systems will last far longer, function more efficiently and safely, save valuable space, and cut upkeep costs.

There is a TUBE-TURN for *every change in flow direction*—elbows, returns, tees, reducers, laterals, nipples and flanges—made with Tube-Turns' exclusive forging process to give unequalled reinforcement at these danger spots.

Get complete facts in the helpful Tube-Turn engineering data book and catalog. Write today!

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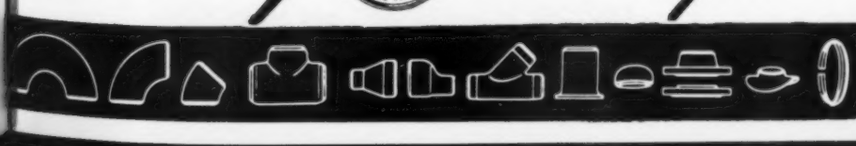


WELDING WITH TUBE-TURNS REMOVES "DANGER AT THE TURNS" IN PIPING

When you think of "turns" in piping systems, remember they occur within tees, reducers, laterals, nipples, heads, etc., as well as within elbows and returns. Wherever there are abrupt *changes in flow direction* you'll find *extra* wear and tear. TUBE-TURN welding fittings provide maximum *extra* strength and safety, and practically eliminate maintenance troubles, at these *danger spots.*

(Continued from November issue)

Direct-Current Control Circuits

OREN G. RUTEMILLER, Westinghouse Electric & Manufacturing Company, Detroit

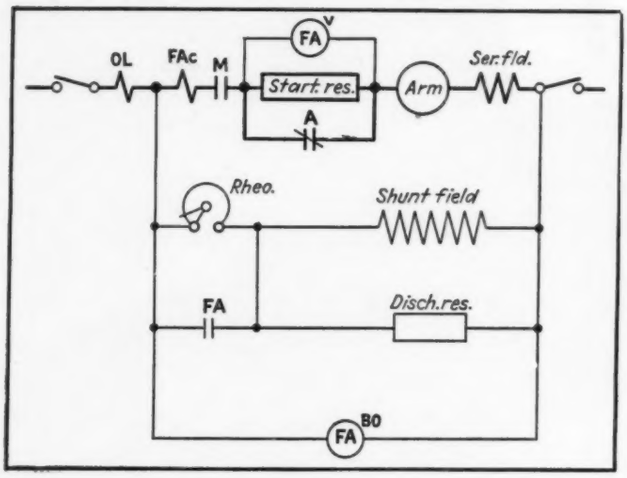
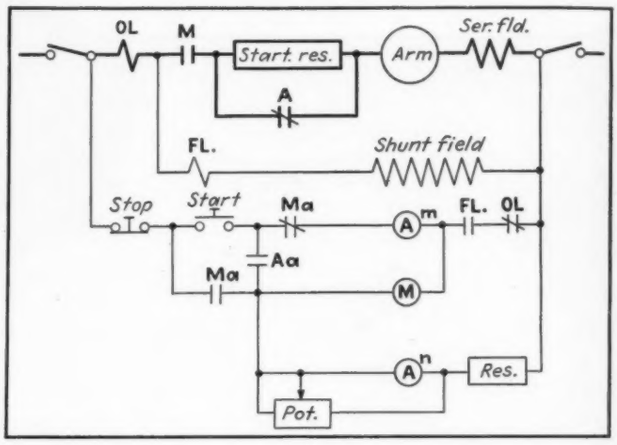


Figure 8. Another method of applying the full-field relay.

This arrangement insures full field on starting, and provides for limiting the armature current when the motor is accelerating from the full-field speed to the speed set by the rheostat. Field accelerating relay *FA* is equipped with two coils, one a voltage coil connected across the starting resistance, the other a current coil connected in series with the motor armature. See Figure 2 for the remainder of the circuit. When line contactor *M* closes the voltage drop across the starting resistor is practically line voltage, and relay *FA* is picked up quickly. When accelerating contactor A closes, voltage coil *FAv* is shorted, but closing of A produces a second current peak, and current coil *FAc* holds relay *FA* closed. As motor approaches full-field speed this current decays and allows the *FA* contacts to open, weakening the motor field. When the motor attempts to accelerate the line current again increases. If it exceeds the pick-up value of coil *FAc* the relay will close its contacts, arresting acceleration and causing a decay of line current, which again causes *FA* to drop out. High inductance of the motor field, plus inertia of the motor and drive prevent rapid changes in speed. Hence the motor will not reduce its speed, but the increased field current will reduce the armature current and cause *FA* to drop out. The fluttering action will continue until the motor reaches the speed set by the rheostat. Setting of the *FA* relay current coil determines the maximum current draw during this part of the acceleration period. Since relay *FA* must handle the highly inductive field circuit, a good blowout arrangement is necessary. Hence the relay is usually equipped with a shunt blowout coil, *FAbo*.

Figure 9. Connections of field loss relay, to prevent excessive speed if the shunt field is deenergized while voltage remains on the armature.

It usually consists of a current relay in series with the motor shunt field and is adjusted to pick up on full-field current and remain closed at any current within the operating range of the motor field current. Contacts of relay *FL* are connected in series with the overload relay contacts so that the opening of its contacts will deenergize the control by opening the line contactor. This type of field loss protection does not protect against the possibility of a short

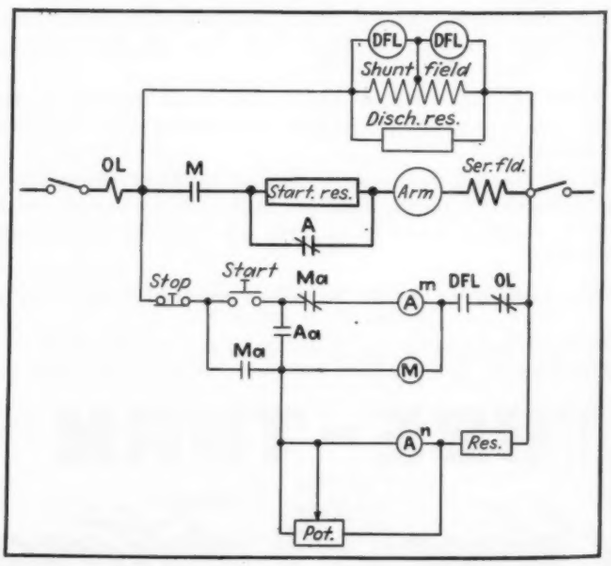


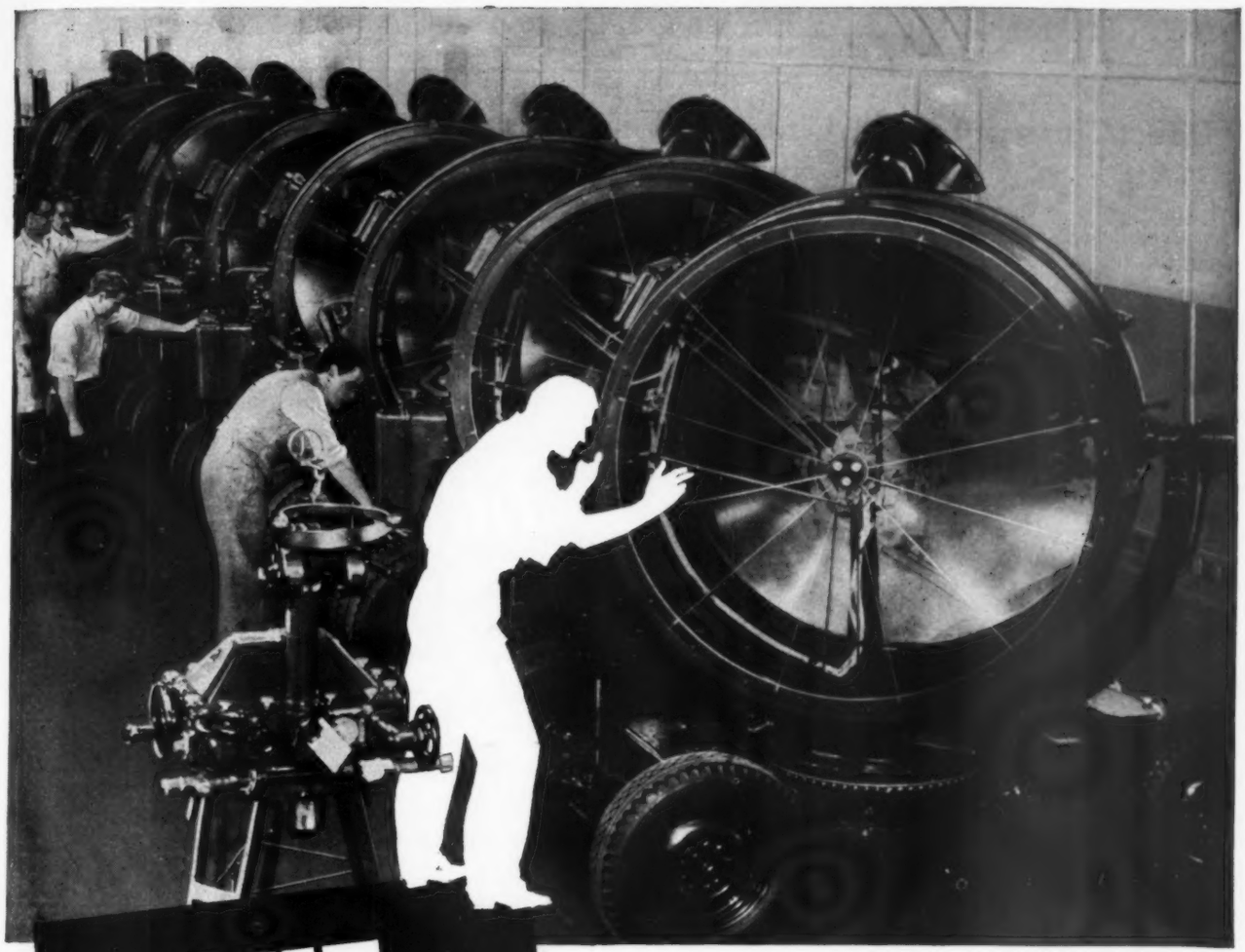
circuit across a part of the field, say across the one field coil. This would cause the motor speed to rise considerably but the current in the field circuit would also rise. Consequently, the series current relay would not respond.

Figure 10. Application of differential field loss protection.

The differential field loss relay *DFL* is equipped with two voltage coils connected to buck each other. Each is connected across one-half of the field winding. Normally the voltage across each coil is the same, hence the relay stays in the out position with its normally closed contacts closed. Shorting out of one field coil or other failure causing an un-

(Continued on page 102)





THE MISSING MAN...

His illness costs your business and the nation:

... a week's production a year
... the full-time work of a million men
... time enough to build 164,706 combat tanks

ILLNESS keeps your men off the job an average of *one week each year*. This estimate is based on a U. S. Public Health Service report. Over half of this lost time is due to the common cold and its complications, several other studies indicate.

A recent N.A.M. survey shows that absences were cut 29.7% in firms which established health programs. In a good health program, soap, hot water and individual tissue towels retard the spread of illness.

"Soft-Tuff" ScotTissue Towels are now enjoyed by over 50% more workers, based on 1941 sales increases. When wet, "Soft-Tuff" towels have 10 times more rub strength than previous ScotTissue Towels, yet are soft as ever.

• • •

For help in improving washroom hygiene, comfort and economy, call on the Scott *Washroom Advisory Service*.

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STAY TOUGH WHEN WET

Soft-Tuff

ScotTissue TOWELS

INDIVIDUAL... SANITARY

Direct-Current Control Circuits (Continued from page 100)

balance of these voltages causes the relay to pick up, opening its contacts and dropping out the line contactor, deenergizing the motor.

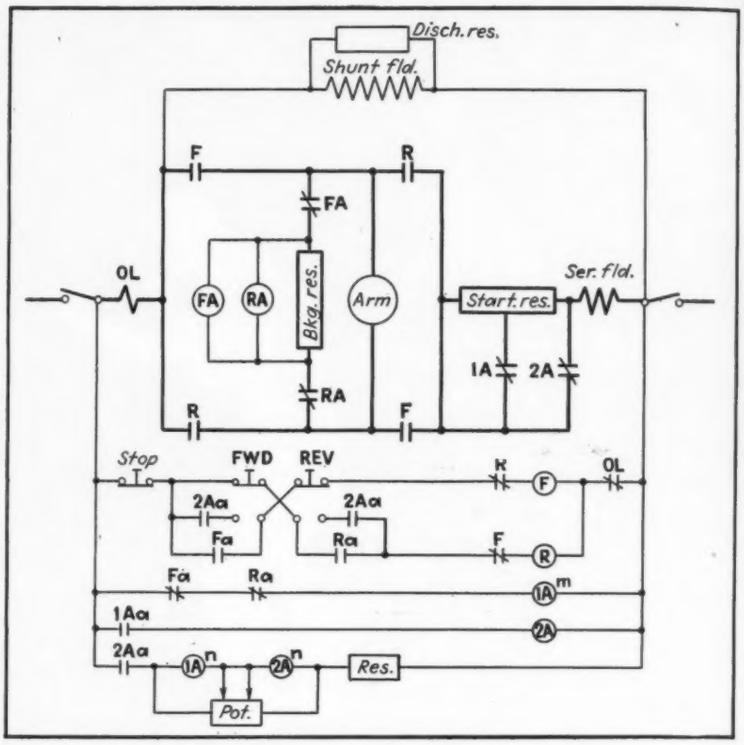


Figure 11. One form of reversing dynamic braking control, consisting of multi-pole contactors having two poles normally open and one pole normally closed. Accelerating contactors *1A* and *2A* are energized in the off position, as in Figure 6. Depressing the forward button energizes forward contactor *F*, closing the two normally open contacts *F* and opening the normally closed contact *FA*. Opening of normally closed auxiliary contact *Fa* starts the timing cycle of the accelerating contactors. Closing of the normally open auxiliary contact *Fa* establishes a holding circuit. When the stop or reverse button is depressed contactor *F* drops out, closing normally closed contact *FA* and setting up a dynamic braking circuit through the braking resistors, which energizes coils *FA* and *RA*. These coils hold the normally closed contact closed, and the normally open contacts open until the braking current drops to a low value. This action prevents bouncing of the back contacts and plugging the motor, because if the reverse button were depressed during the braking period contactor coil *R* would not have sufficient strength to overcome the pull of the *RA* coil until the motor had almost stopped.

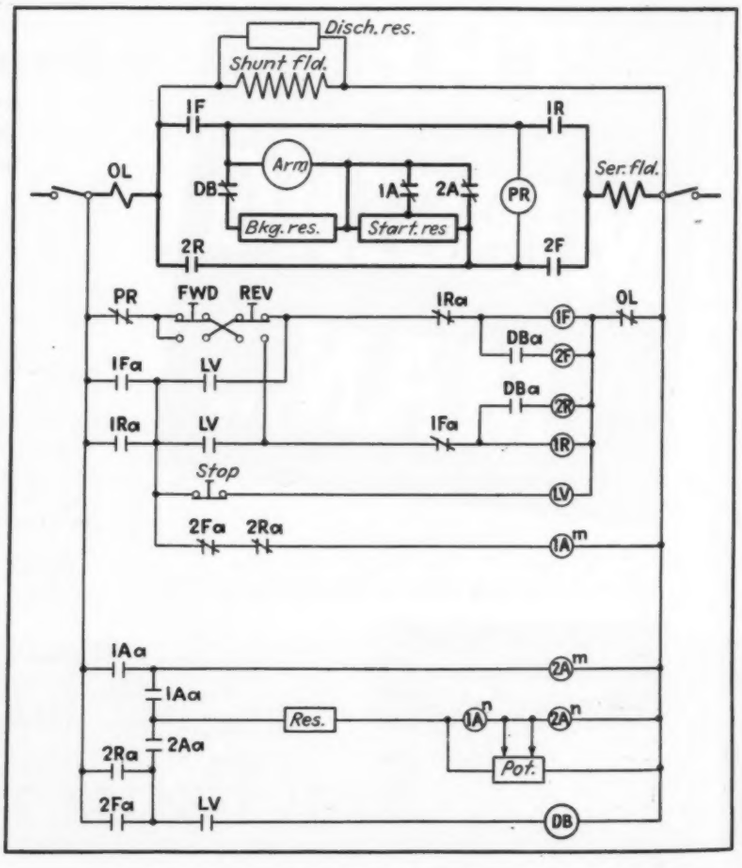


Figure 12. Another form of reversing dynamic braking starter using a spring-closed dynamic braking contactor and single-pole normally open directional contactors. When start button is depressed contactor *IF* is energized. Closing the normally open auxiliary contact *IFa* energizes relay *LV* to establish a holding circuit and also energizes accelerating contact *1A*; *1A* contactor energizes *2A*, and *2A* energizes *DB*. In turn, *DBa* energizes *2F* and normally closed contact *2Fa* starts the accelerating timing.

Depressing the stop button drops out *LV*, closing *DB* immediately. Plugging is prevented by relay *PR*, a voltage relay connected across the motor armature. Its normally closed contacts remain open, preventing the pick up of the reverse directional contacts until the armature speed drops down to a safe value for plugging.

Here's an executive that *is an executive.* He's thinking ahead. And *looking ahead!* Because he's about to sign an order for heating equipment.

Is he "winking" at quality and seeing only price? Not for an instant. He keeps both eyes wide open — and specifies Modine Unit Heaters.

Instead of cutting cost corners today, he has one eye on tomorrow's profits... the other on Simon Degree. Simon Degree is that terrible pain-in-the-neck that eventually hits the man who buys not wisely but too "close." Simon personifies ineffective heating and the terrific operating and maintenance costs that built-to-meet-a-price equipment will be running up five years from now.

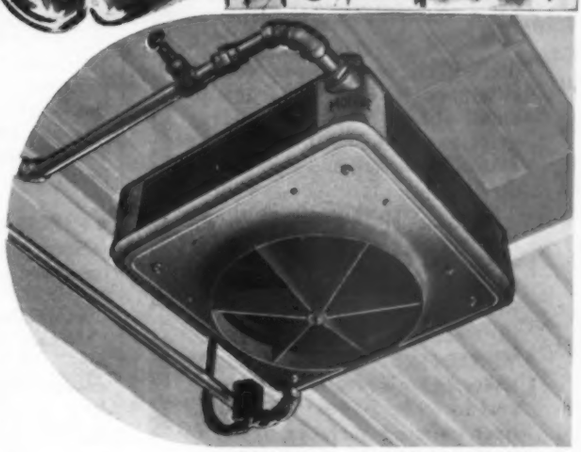
You need Modine *proved*, automatic, fast, effective, plant heating — not only to keep production and morale at top notch *now* — but to keep costs down, now and *years from now!*

Modines are *built better* to *last longer.* Yet you pay but little more per unit in first cost. In the long run you'll pay less per year. Installation costs are lower, and installation is faster.

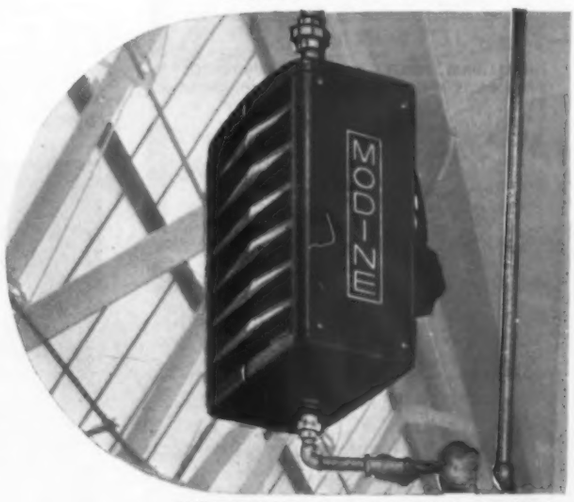
Modine *delivery is as prompt as any in the industry.* Write for latest literature.

MODINE MANUFACTURING CO., 1730 Racine St., Racine, Wis.

Look in your phone book for Modine representative's name — "Where to Buy It" section under Heating Apparatus.



VERTICAL DELIVERY MODEL



HORIZONTAL DELIVERY MODEL

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THE UNIT HEATER THAT IS FASTER AND EASIER TO INSTALL

FALLS KILL 67 PEOPLE EACH DAY

Wherever they Walk Make it SAFE with

TEN-LOX

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APPROXIMATELY 23% of industry's compensated occupational injuries are caused from falls. TEN-LOX will save man-power and man-hours by preventing injuries from falls. How? By providing non-slip walking surfaces with TEN-LOX stair treads, thresholds and floor tile.

TEN-LOX is a non-corrosive, rust proof alloy with large and small abrasive grits. The large grits extend clear through the castings and the small grits extend down at least 1/16th of an inch... TEN-LOX is the only anti-slip material with this feature. It is approved by the Underwriters' Laboratory and assures non-slip performance under all conditions—oily, greasy, wet or dry.

TEN-LOX is produced in 7 styles of stair treads, thresholds and floor tile. It is easily installed over existing surfaces or set in fresh concrete.

Get all the facts. Send for the new TEN-LOX folders.

THE NATIONAL BRONZE & ALUMINUM FOUNDRY CO.
8905 LAISY AVENUE CLEVELAND, OHIO

● Note how abrasive grits extend clear through entire thickness.

The National Bronze & Aluminum Foundry Co.
8905 Laisy Ave., Cleveland, Ohio

Please send us complete information on TEN-LOX

Name _____

Company _____

City _____ State _____

YOU WANT TO KNOW

more about the items mentioned on this page

Letters to the addresses given will bring information

● "DOLLARS for Democracy" is the title of a pamphlet issued by the Division of Information, Office for Emergency Management, Washington, D. C. It puts before you in terse, vivid terms the facts concerning the mobilization of American money for defense, some effects of the effort, where the money comes from.

● YOU MAY NOT aspire to be a phone balancer, brilliant conversationalist, and two-handed doodler all at once, but you may want your hands free for writing and paper handling when telephoning. With the aid of a detachable soft rubber device you can perch your phone on your shoulder and then proceed as before with the work at hand. Hold-the-Phone Co., Simms Building, Dayton, Ohio.

● PAYROLL-ACCOUNTING machine has a special aligning device to eliminate manual adjustment of forms used, a carbon bracket to eliminate loose carbon paper, and an automatic device that voids checks when deductions exceed earnings. Can also be used as a 10-figure-keyboard adding machine. Underwood Elliott Fisher Co., One Park Ave., New York.

● CONSERVATION, substitution, and reclamation of paper and packaging materials is discussed by officials on the OPM, an executive of a British plant, and executives of American plants in a booklet, "Meeting the Shipping Container Shortage." $1. American Management Association, 330 West 42nd St., New York.

● DRAFTSMEN WHO PRAY for an easily read decimal-equivalent chart will have much to be thankful for if you hang a new giant chart (26x39 inches) on the wall for them. With equivalents from 1/64 to 63/64 printed in type 1¼ inches high, in black and red on white, the chart can be read 50 feet away. Ask for it on your business stationery. The Frederick Post Co., 3650 North Avondale Ave., Chicago.

● EIGHTY-INCH MOUTH of the giant developer consumes quantities of paper daily that it may turn out 18,000 black-and-white drawings a day. This direct method of printing black lines on white paper requires just 50 seconds, they say, to expose and develop each print. Westinghouse Electric & Manufacturing Co., East Pittsburgh.

● TWO NON-BURNING, non-hardening, plastic, sealing compounds have been developed: one to seal cracks in wall openings around electrical cables and conduits against moisture; the other to seal joints in boiler casings against air leakage. Both remain plastic over long periods of time and can be removed at will. Halowax Corp., 30 East 42nd St., New York.

● TO WARN YOU of fires before they get big, an automatic watchman in a plastic housing sounds an alarm as soon as the temperature of the room in which it is installed rises to 135 degrees F. International Fire Equipment Corp., West New Brighton, Staten Island, N. Y.

● YOUR PAINTED WALLS hard to clean? Protective covering for walls newly painted or recently cleaned prevents dust, dirt, and grime from penetrating the pores of the paint. When removed by water and sponge, it takes the dirt with it and leaves the walls in their original paint-clean condition. William R. Harshe Co., 540 North Michigan Ave., Chicago.

● METAL-COATING COMPOUND, for use in making repairs to damaged tin coatings, looks like tin yet is rust resistant and so is said to protect underlying iron or steel against rust and corrosion to the

TO SOLDER ELECTRIC WIRES together in a jiffy you merely slip a self-contained soldering unit over the twisted wires, touch a match to the stub, wait a few seconds for cooling, knock off the shell, and there you are —a quick job without fuss or muss. Jiggers Inc., 215 West Illinois St., Chicago

STOPPED
BEARING FAILURES... PRODUCTION DELAYS
with SUN H.D. LUBRICANTS
ANOTHER STEP TO A HIGHER P-Q*
Labor, equipment and the right lubricants all functioning at their best is the first step toward increased production—toward the setting of a higher Production Quota (P-Q*).
This was conclusively proved in a large Eastern Rubber Mill. Bearings on large mixers were constantly failing . . . "time-outs" for repairs were crippling production. Many lubricants and many types of bearings were tried . . . all failed to stand up under operating temperatures of 240° F. and pressures of a quarter of a million pounds per square inch.
Then, after a survey by those "doctors of industry"—SUN Oil Engineers—a switch was made to SUN Heavy Duty Lubricants. The problem was solved! There hasn't been a bearing failure since . . . production delays have stopped . . . and a new P-Q* has been set by plant engineers.
Is the P-Q* of your plant as high as it should be? Can these modern, heavy-duty lubricants help you eliminate delays in your plant . . . step up production . . . and permit the setting of a higher P-Q*? Get the answers today, write . . .
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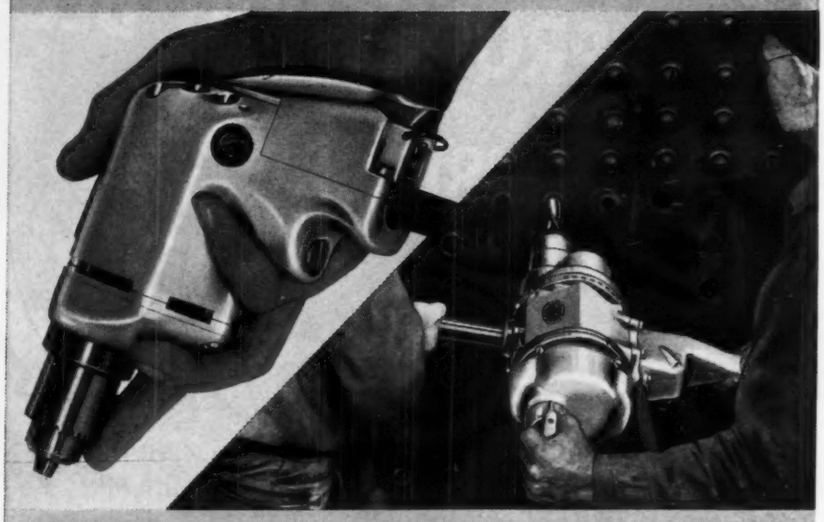
VAN DORN Builds a Drill Model



To Fit EVERY DEFENSE Need

WHETHER your Defense operation requires Electric Drills for continuous production, or plant maintenance work—Van Dorn makes the *correct* Drill for the job. Van Dorn's complete line includes 30 Portable Electric Drill models, ranging from the tiny, feather-weight 3/16" Hornet, to the brute 1½" Heavy Duty Drill and Reamer. Among these 30 Drill models there's one exactly suited to *your* kind of work—with features, style and capacity especially adapted to any drilling operation you specify.

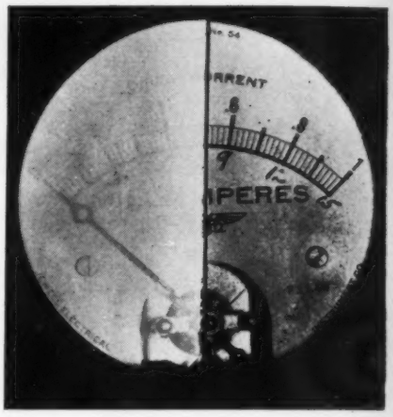
Van Dorn Drills are available for Defense requirements from leading jobbers in key cities, and Van Dorn's nation-wide, company-owned factory branches give prompt tool servicing. Ask your jobber to demonstrate the Van Dorn Drills you need—or any of Van Dorn's 100 other Portable Electric Tools. For complete Catalog, write to: The Van Dorn Electric Tool Co., 719 Joppa Road, Towson, Maryland.

"Van Dorn"
(DIV. OF BLACK & DECKER MFG. CO.)
PORTABLE ELECTRIC TOOLS

For Power Specify "Van Dorn"

same extent as hot-dipped zinc coating of the same thickness. Because melting point is lower than that of tin, original coating is not harmed by application. American Solder & Flux Co., Trenton Ave. & Norris St., Philadelphia.

• A BABBITT METAL for bearings subject to high pressures and temperatures is said to have a tensile strength of 17,500 lb. per sq. in., yield point of 65,000 lb. per sq. in., brinnell hardness of 27, and pouring temperature ranging from 950-1,000 degrees F. Nickel treatment gives it a hard glossy surface desirable for generators, motors, and other high-speed equipment. Magnolia Metal Co., Department 18, 120 Bayway, Elizabeth, N. J.



WHEN LIGHT streaks across the specially treated glass covering the right-hand side of this instrument face the glass does not glare nor reflect images and so reduce visibility. Glass on the left-hand side is not treated. Radio Corp. of America, 30 Rockefeller Plaza, New York

• SILVER LINING of a concentrating floodlight bulb for high-bay and high-ceiling lighting is said to send the full light the filament develops down to the working level. Thirteen sizes available from 1,500 watts down. Birdseye Division of Wabash Appliance Corp., 335 Carroll St., Brooklyn, N. Y.

• NEW SOUND FILM, "Motion and Time Study Principles With Applications Showing Better and Easier Ways to Work," is available for rental at the Department of Visual Instruction, University of Iowa, Iowa City.

• DROP IT SIX STORIES on asphalt pavement, or leave it three months in water and still it will work, say the makers of a rubber-cased flashlight. Also, they say, it resists magnetizing from tool boxes and metals. Two-cell and three-cell sizes, focusing or fixed-focus types. William M. Lennan, Inc., Pasadena, Calif.

• HOW EVERY AMERICAN can do his part in the home, in industry, in every walk of life, for national defense, is forcefully outlined in "You Can Defend America." 10¢. Moral Re-Armament, Judd & Detweiler, Washington, D. C.

Another nationally famous user of

MASTER MOTORS

To maintain their position of leadership SCHENLEY DISTILLERS CORPORATION uses the best of materials and the finest of processing equipment. Schenley engineers find that their plant equipment is improved, made more compact, lower in cost, more convenient, more safe by using Master motors that meet the requirements exactly of each individual application.

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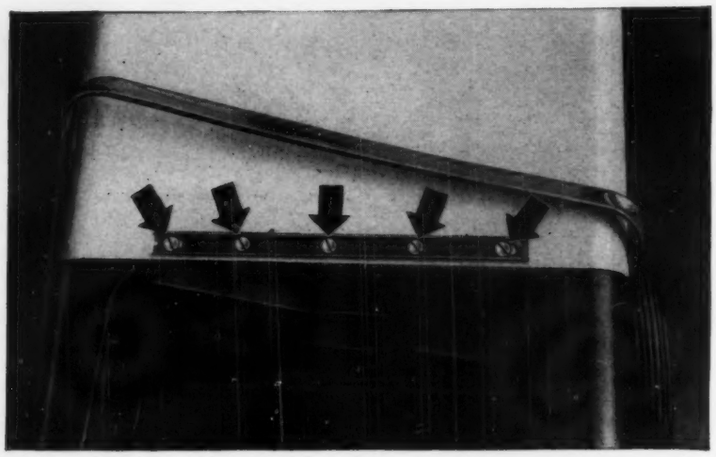
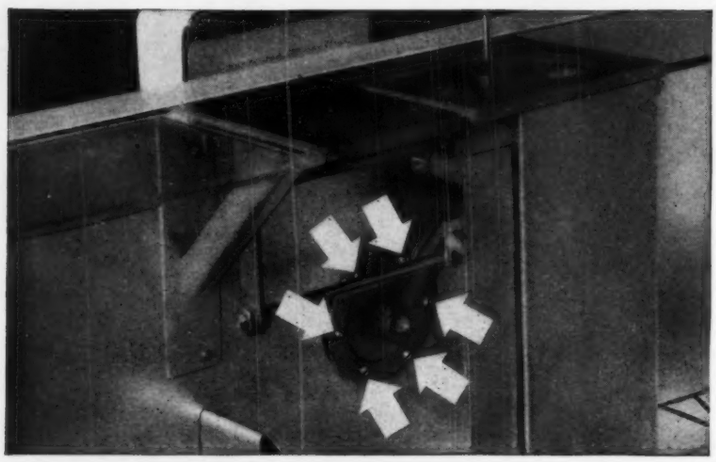
MASTER

CAN YOU *stretch a*



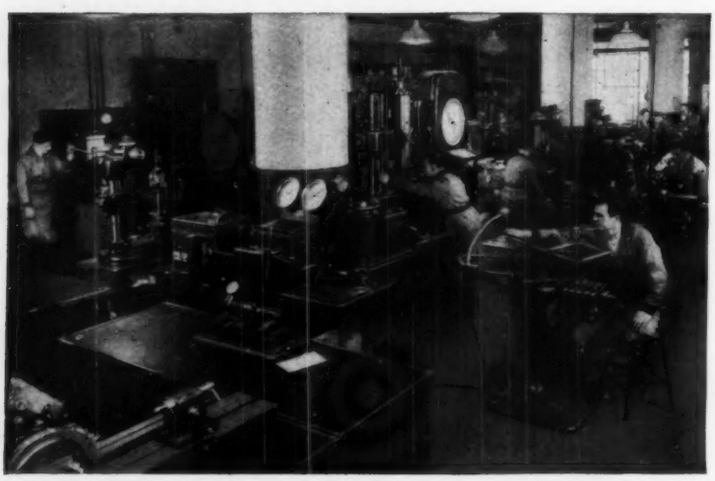
Simplify ASSEMBLY . . .

Dual assembly made in one simple operation! The same Self-tapping Screws fasten a molding retainer to the housing, and the housing to the cast iron base of a battery charger made by Hammett Electric Mfg. Co. P-K Screws also make it easier to attach instruments to the unit.



Save OPERATIONS . . .

Here, Self-tapping Screws hold a rubber gasket in place around the coin box shaft of the Vendall Selective Dispenser. "No tapping needed! Production decidedly speeded up – costs reduced – that's why Parker-Kalon Self-tapping Screws are preferred in our production line", says the Friend Mfg. Co.



Cut Out SLOW UPS . . .

Many thousands of dollars were invested to set-up this Parker-Kalon Quality-Control Laboratory. Here, rigid control protects against "doubtful screws" . . . screws that look all right but some of which fail to work right. There are no "slow-ups" when you specify *Parker-Kalon!* Every screw starts easily – drives in fast – holds tight!

SELF-TAPPING SCREWS FOR EVERY METAL AND PLASTIC ASSEMBLY . . . AND OTHER FASTENING DEVICES

work-week to 8 DAYS?

It HAS been done on many assembly jobs – A P-K Assembly Engineer may point the way for you!

Whether you make planes, tanks, bombers, or any of the thousands of other products for defense, or for essential civilian needs, in today's vital task of getting more assemblies per man-hour, a Parker-Kalon Assembly Engineer can be a big help! He can help you effect time-savings of 25 per cent to 50 per cent in the many assemblies suited to Parker-Kalon Quality-Controlled Self-tapping Screws. Wherever the P-K Engineer uncovers a place to use this simpler method . . .

You make a triple saving that adds extra man hours of production time to your work-week. You *simplify assembly!* You *save operations!* You *cut out slow-ups!*

How can you obtain all the benefits of this simpler, better fastening method? Get together with a Parker-Kalon Assembly Engineer without delay and search out all opportunities to apply Self-tapping Screws. You'll find that he knows present day assembly practices – on all sorts of products – from the ground up. You'll find him practical . . . he is pledged to recommend Self-tapping Screws only when they offer a better, more economical means of assembly. And, he is unbiased because Parker-Kalon makes all types of Self-tapping Screws – both thread-cutting and thread-forming.

Sheet-metal, heavy steel, die castings or plastics . . . no matter what material your production uses, the chances are 7 out of 10 that a Parker-Kalon Assembly Engineer can help you speed-up fastening jobs with Parker-Kalon Self-tapping Screws.

No Need to Interrupt Production!

It's an easy change from slower, more costly methods to Self-tapping Screws. No major production changes necessary . . . no special tools or skilled hands required.

TAYLORCRAFT SPEEDS ASSEMBLY *of planes for Civilian Pilot Training Program by using Parker-Kalon Self-tapping Screws for many applications. The assembly shown above is typical.*

• • •

Start Getting More Assemblies Per Man-Hour – NOW!

Write for the Parker-Kalon Assembly Engineer to schedule a call at your plant to give you the benefit of his specialized knowledge. Or submit full details of assemblies and we'll mail recommendations and samples. Parker-Kalon Corp., 196-200 Varick Street, New York.

PARKER-KALON

Quality-Controlled

SELF-TAPPING SCREWS

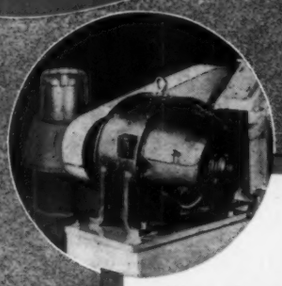
Give the Green Light • to Defense Assemblies

FOR FACTORIES WITH A-C. POWER..
A NEW PRODUCTION AID

AN ALL-ELECTRIC ADJUSTABLE-SPEED DRIVE for A-C. CIRCUITS

Speed Ranges up to 16 to 1
Sizes 1 to 30 hp.

RELIANCE V*S DRIVE

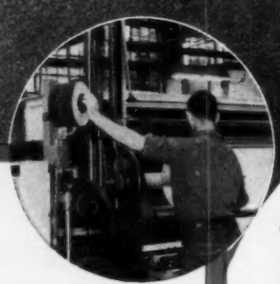


POWER

Plenty of it, applied directly without intermediate speed-changing devices.

SAFE SPEEDS FOR THREADING AND INCHING

The drive can be arranged to give very slow speeds while threading material by hand or setting up work.



SPEED CHANGES

Smooth changes over ranges up to 16 to 1. Wider ranges under special conditions . . . Speeds can be adjusted while machine is in operation.

QUICK STOPPING

Obtained electrically either by operation of speed adjuster handle or *stop* button.

CONTROLLED ACCELERATION

Torque is provided to suit the job. No clutches are needed. Acceleration is smooth so that driven machine and material in process are not subjected to undue shock or strain.

SPEED SETTING

When set for a given operation the motor may be stopped and started without interfering with the speed setting.

All within Easy Reach

The Reliance V*S Drive provides convenience without limitations. Speed changer and *start-stop* station can be placed anywhere that you can run a wire.

RELIANCE ELECTRIC & ENGINEERING COMPANY
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RELIANCE A-C D-C MOTORS

TAKES 1/5 AS MUCH OIL...

1/5 THE TIME FOR APPLICATION

● THE FIRST GALLON of Stanodrip tested in the bottle oilers on the homogenizer pictured below lasted 10 days. A gallon of the engine oil previously used had never lasted over two days. With no more trouble than it took to make this simple test, a Wisconsin manufacturer cut lubricating time and oil used 80% on these machines.

The test was made when a Standard Oil Engineer was asked for his recommendation. He analyzed the operating conditions and picked Stanodrip . . . a high quality dripless oil . . . as the lubricant best fitted to meet them. The first gallon tested proved that Stanodrip would more than pay for itself in the oil and time it saved.

Let a Standard Oil Engineer test Stanodrip in some application in your plant. Just phone the local Standard Oil Company (Indiana) office or write to 910 South Michigan Avenue, Chicago, Illinois. Ask to have a Lubrication Engineer call.

Copr. 1941, Standard Oil Company (Indiana)

STANODRIP

1. Proper Viscosity Grades. 2. Low Pour Point. 3. Dripless. 4. Water Resistant. 5. Stable. 6. High Viscosity Index.

STANDARD OIL COMPANY (INDIANA)

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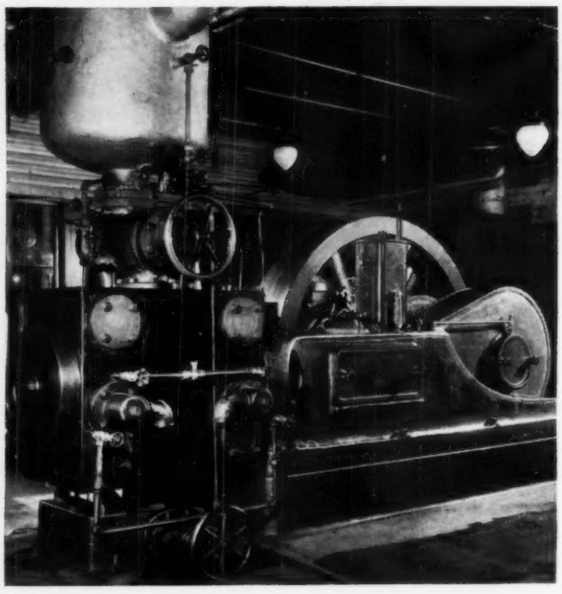
STANOIL FOR COLD STARTS AND HOT RUNS IN BEARINGS AND GEAR CASES

Are there certain motor bearings in your plant in which there's a race between "warming up" and "burning out" each time they're started in cold weather? Do you have reduction gears that must be heated before it's safe to turn them over . . . all because it's necessary to keep a high viscosity oil in them to withstand high operating temperatures?

Then, Stanoil is just what you need. It has high V. I. That means that it thins out less at high temperatures and flows easily at low temperatures. It has an unusually low pour test, too. Discuss one of your cold weather starting problems with a Standard Oil Engineer. He'll recommend the grade of Stanoil you need and help you test it.



SAVES 2 QUARTS OF OIL OUT OF 3, EVERY 8-HOUR DAY

Two things bothered the Minnesota operator of this Corliss type engine above. It had a big appetite for oil—3 quarts or more a day—and much of the oil was carried over into the exhaust steam where it was troublesome when the steam was used for heating.

By cutting down oil consumption he could reduce the carryover. But would the engine get adequate lubrication? The operator decided that he could use the help of a Standard Oil Engineer on that question. The Engineer analyzed operating conditions and made his recommendations. With the cylinder oil he suggested, engine feeds could be reduced. Then they waited for oil to show up in the exhaust steam. None appeared. Finally oil feeds were cut down to one pint per 8-hour day, with adequate lubrication and no carryover trouble.

Standard Oil offers the widest range of steam cylinder lubricants available to operators in the Middle West. Call your Standard Oil Engineer at the first sign of engine lubricating trouble.

FROM 3 BEARING FAILURES IN 6 MONTHS, TO NONE IN 2 YEARS

SUPERLA GREASE

The superintendent in a Minnesota mill reasoned that one bearing failure might be just an accident . . . two bearing troubles in six months could be coincidence . . . but the third failure left no doubt—some changes had to be made!

The installation, bearing alignment, etc.—seemed all right. What about the lubricant? That problem was turned over to a Standard Oil Engineer. Since Superla Grease No. 2X—which the engineer recommended—has been used, there has not been one bearing failure. And that was over two years ago.

SAVE YOUR TIME AND YOUR COMPANY'S MONEY

Have you noticed, from examples on this page, how easy it is to solve many lubricating difficulties simply by giving a Standard Oil Engineer a chance to work with you on them? You save your time experimenting with various lubricants. You save on repairs and replacement costs for your company. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois for additional information on any of the products mentioned here, or for the Lubrication Engineering Service offered. In Nebraska, write Standard Oil Company of Nebraska at Omaha.

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HERE'S HELP ON YOUR
DEFENSE
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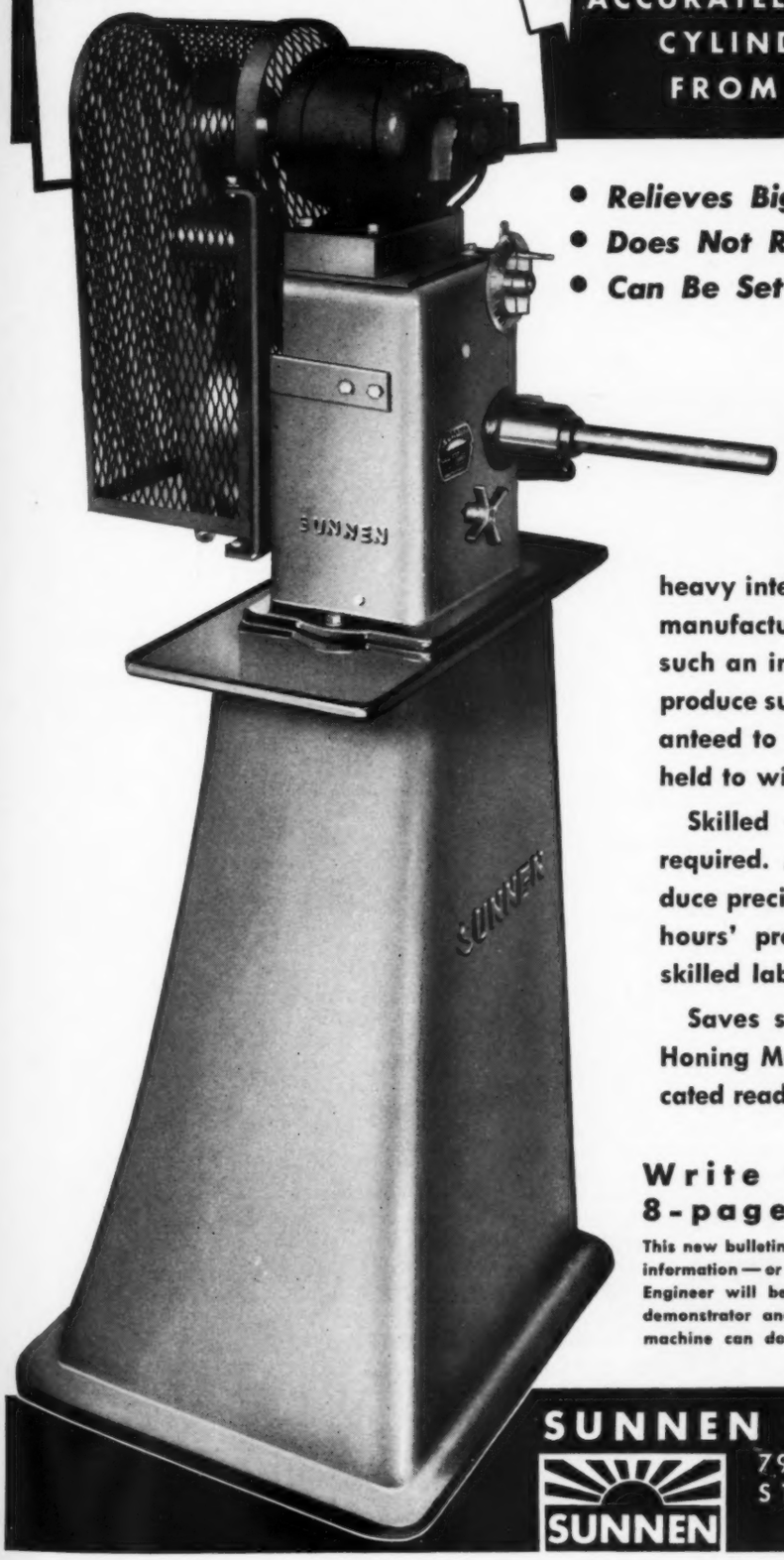
SUNNEN PRECISION
HONING MACHINE
ACCURATELY FINISHES INTERNAL
CYLINDRICAL SURFACES
FROM .185" to 2.400"



- *Relieves Big Internal Grinders!*
- *Does Not Require Skilled Labor!*
- *Can Be Set Up In Less Than a Minute!*

BY USING the Sunnen Precision Honing Machine to accurately grind and finish internal cylindrical surfaces from .185" to 2.400", many defense manufacturers have been able to release heavy internal grinders for other work. These manufacturers have been amazed to find that such an inexpensive piece of equipment can produce such accurate work. Accuracy is guaranteed to within .0001", and has often been held to within .000025" in production work.

Skilled or experienced operators are not required. Any intelligent workman can produce precision workmanship with only a few hours' practice. You can shift your highly skilled labor to other jobs.

Saves set-up time — the Sunnen Precision Honing Machine can be set up and work located ready for honing in less than one minute.

Write for FREE 8-page Bulletin

This new bulletin will give you complete information — or if you prefer, a Sales Engineer will be glad to call with his demonstrator and show you what this machine can do for you on your job.

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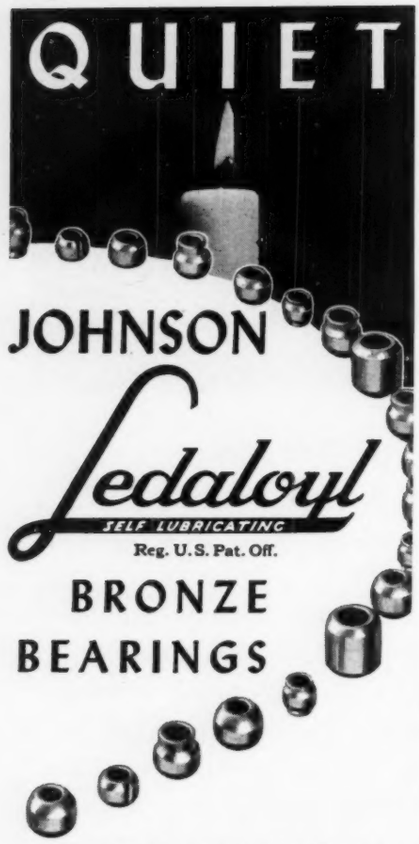
ST. LOUIS, MISSOURI
Canadian Factory — Chatham, Ontario



A noisy bearing means trouble . . . usually indicates early failure. Why not prevent noise? Insure smooth QUIET operation by installing Johnson LEDALOYL—the ideal self-lubricating bronze bearing.

Evenly distributed over all surfaces of every LEDALOYL bearing are millions of tiny, evenly spaced pores. Each pore serves as an oil reservoir. When the shaft turns, a thin, protecting film of oil covers the entire bearing area. This is why Johnson LEDALOYL bearings operate so quietly, so efficiently and for such a long period of time. Why not try LEDALOYL on your next application? Write today to—

JOHNSON BRONZE
Sleeve Bearing Headquarters
512 S. MILL ST., NEW CASTLE, PA.

Specify JOHNSON BRONZE

WHAT'S NEW IN EQUIPMENT

Thermostats

Thermostats of horizontal design, known as TA42A and TA42B are available in two types, one for heating applications, the other for heating and/or cooling. Purposely designed for use where accurate and dependable control of line voltage, heavy-duty devices are involved; capable of handling directly large motor-driven units, cold blowers, cooling equipment, industrial stoker-fired heating plants. On larger or polyphase motors they should be used in connection with magnetic starters. Or they can be used in low-voltage circuits.

Horizontal design provides maximum air circulation and reduces the effect of contact heat. M-H Con-Tac-Tor snap switch provides switching action. This is a non-magnetic switch, self-enclosed to protect it from dirt, dust, moisture, and grime. Another feature is the temperature-setting knob, which can be removed to lock the thermostat to prevent tampering. Models are also available with a "positive on" feature for cooling applications. Minneapolis-Honeywell Regulator Co., Minneapolis.

Mercury Switch

In double flow mercury switching, two tails of mercury pulling in opposite directions over a ceramic barrier until severed, prevent double contacting where vibrations exist. When closing, the two approaching bodies of mercury pile up a double thick electrical conductor. Double flow operates either as a slow rolling motion or equally well on a high-speed mechanical snap action. Switches in unbreakable metal of 10, 20, 35, and 65 amp. Durakool, Inc., 1029 North Main St., Elkhart, Ind.

Hose for Paint and Lacquer

Hose for all standard paint and lacquer spraying equipment, with the tube built of Ameripol, its own type of synthetic rubber developed in its laboratories, is announced by The B. F. Goodrich Company, Akron, Ohio. Line replaces the company's Lacquer hose and its Main-stay line of paint spray hose. Made in inside diameters of $\frac{1}{4}$, 5/16, $\frac{3}{8}$, and $\frac{1}{2}$ inch, and outside diameters of $\frac{1}{2}$, 39/64, 11/16, and $\frac{7}{8}$ inches. In the $\frac{1}{2}$ inch inside diameter size, construction is two-braid, while in the other sizes it is one-braid, made of heavy tensile cords. Capable of being used as air hose with an ample margin of safety. Tube is a black, oil-resistant compound, working pressure for all sizes is 150 lb. maximum.

Slant-Box Rack

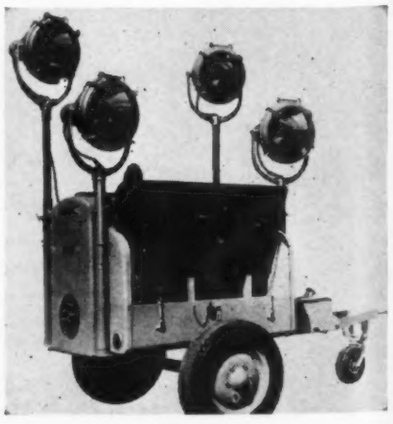
Designed to store ordinary shop boxes at an angle, a rack that converts them into hopper-fronted storage bins and automatically feeds contents toward the front is announced. Individual racks of welded steel construction interlock to form storage units of any desired shape or capacity. Contents of boxes are visible and accessible. Tilted runners hold boxes at the proper angle; a wide lip holds them securely in position. Stackbin Corp., 50 Troy St., Providence, R. I.

Portable Lighting Unit

"Nite-Hawk," portable floodlight unit easily towed by an auto or small truck, is a fully self-contained source of light and fills the need where power lines are unavailable or where the connection and set-up would be too expensive. Four 1,000-watt wide-angle floodlights, one on each corner, cast powerful beams in the same or different directions. Each light is individually operated from a control panel and is adjustable up and down, and in all directions. The lights may be raised to a height of 8½ feet and swung in a 180 deg. vertical arc.

In addition to providing light, this unit has a control panel with receptacles for operating small "Universal" hand tools, such as electric drills, saws, and hammers.

Power is supplied by an air-cooled,

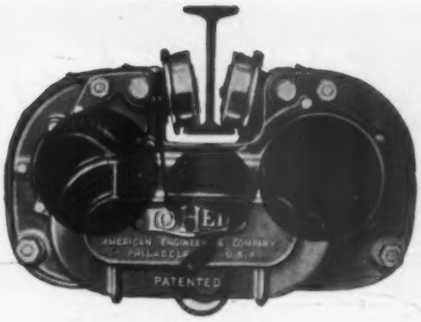


AMERICAN ENGINEERING COMPANY

The Lo-Hed Hoist Is Applicable To Any Monorail System
There's A Balanced Lo-Hed Electric Hoist For Every Purpose

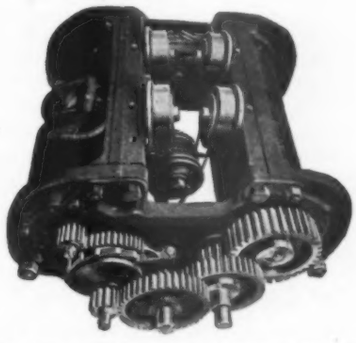
OTHER A-E-CO PRODUCTS: TAYLOR STOKERS, MARINE DECK AUXILIARIES, HELE-SHAW FLUID POWER

Look in your Classified Telephone Directory under "A-E-CO LO-HED HOISTS" for your nearest representative.



WATCH FOR BALANCE IN HOISTS

LO-HED, the *Balanced* Hoist. You can identify a Lo-Hed Hoist a "mile away". Many have said just that. And it's true. A Lo-Hed Hoist looks distinctly different from any other hoist—because it is different. The difference begins with the arrangement of the motor and drum. See how they are arranged around the beam! This unusual construction permits the use of efficient spur gearing, easily removable covers. You also get minimum headroom, a valuable plus advantage if hoists are to be used now or later under low headroom conditions. Write for Lo-Hed catalog today.



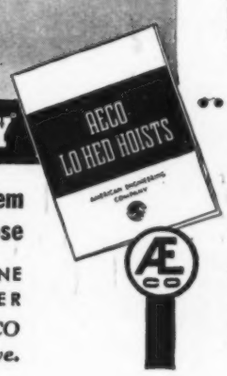
LOOK AT THE BALANCED LO-HED!

It Costs Less To Operate—All gears are efficient stub-tooth spur gears running in a sealed oil bath . . . gear shafts and trolley wheels are equipped with heavy-duty ball or roller bearings.

It Costs Less To Maintain—Sturdy construction . . . seldom, if ever, requires removal from rail . . . covers of controller, motor, drum and gearing are easily removed.

It's Safe—Factor of safety of over 5 at full capacity . . . 100% Positive Automatic Stop when load reaches upper limit . . . Automatic Holding Brake prevents load from drifting when current is shut off . . . short, strong shafts minimize torsional stresses.

It's Protected—Controller is fire, dust and moisture proof . . . motor totally enclosed . . . gearing sealed in . . . motor and drum covered by easily removable covers.



AMERICAN ENGINEERING COMPANY
2426 Aramingo Avenue, Philadelphia

☐ Please send me your complete catalog of LO-HED HOISTS.
☐ Ask your representative to get in touch with me promptly.

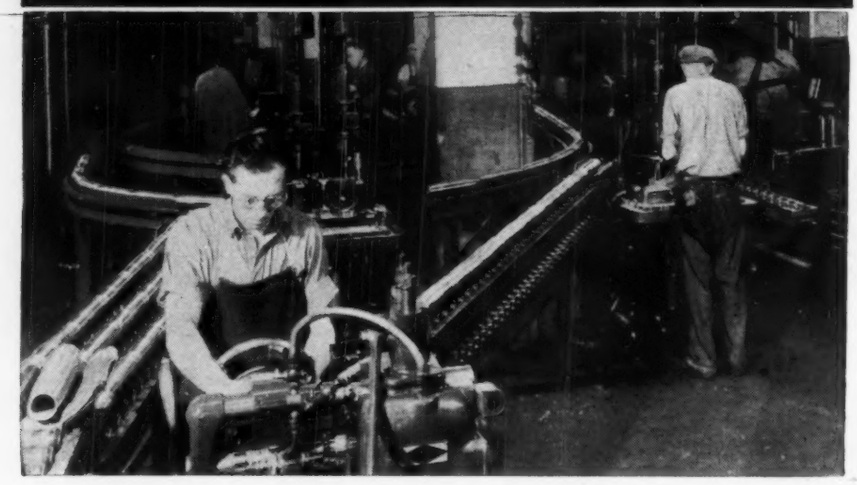
Name_____

Company_____

Street Address_____

City_____ State_____
(Please print plainly)

GET SPEED! .. AND SAVE MONEY, TOO



Installed at strategic points in your production system—Standard Conveyors often prove to be practically the only equipment needed to accelerate the pace of production. Saving valuable time—using plant space more effectively—Standard Conveyor engineers have worked out problems like these for many manufacturers. Here is a representative example in a large armament plant where Standard Conveyors are used for fast, safe "line" production of 3 inch A. A. shell:

We selected your type of roller conveyor for all of our conveying operations because we felt that the contour of your steel roller is very favorable to the transportation of shells which have a finish turned copper band on them. The concave roller gives the band a two- point contact, and consequently reduces the liability of damage by 50% over what it would be if the rollers were straight or just slightly concave.

Get Conveyor Engineering That Shows Results

Because of operating benefits like those cited above, Standard Conveyors inevitably result in stepped-up production, plus a substantial bonus of cost savings in material handling. To be certain of conveyor engineering that will show results, call in a Standard Conveyor engineer—check with him to see how Standard Conveyors can earn and save in your plant.

Send for 76-page Standard Booklet

Interesting and informative, this booklet, (FM-12) "Conveyors by Standard," will prove a valuable reference book on conveyors and conveying methods to every production executive and others concerned with fast, low-cost material handling.

STANDARD CONVEYOR COMPANY

General Offices: North St. Paul, Minn.

Sales and Engineering Offices in Principal Cities

"THE STANDARD OF VALUE"

Standard CONVEYORS

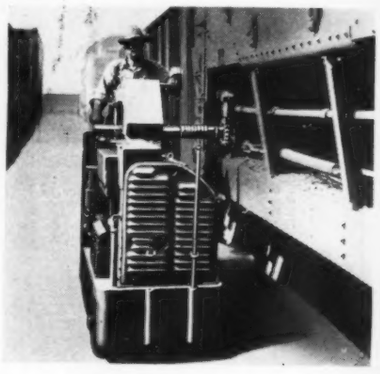
FIRST FOR FASTER PRODUCTION

14-hp., Le Roi engine, equipped with an electric starter. A 5,000-watt self-regulating d.c. generator, connected to the engine, delivers direct current at 110 to 120 volts; the voltage being adjustable by means of a rheostat located on the control panel.

Mounted on heavy-duty, multiple-leaf steel springs with two pneumatic-tired wheels. A retractable caster wheel is provided enabling one man to move the unit about the job with ease. Can be quickly hitched to towing vehicle. Lister-Blackstone, Inc., 1706 South 68th St., Milwaukee.

Wrench Truck

Delivering mobile power on outdoor jobs instead of the conventional load-handling, Type IE Unit operates as a wrench truck for "trapping" loaded hopper cars. Truck is gas-electric, but can be furnished with battery power. Travel speed is up to 6 miles per hour. When emptying cars of loose materials, operator lines up the truck with the squared shaft

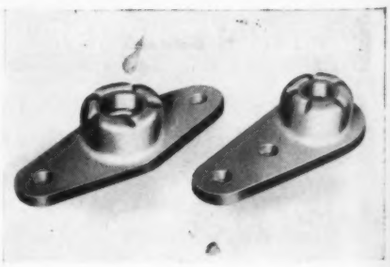


projecting from side of car; raises or lowers wrench to correct height through a motor-operated mechanism, thereby shortening the process of opening the bottom gates and of winding them up again after load has been dumped. One truck can open and close 515 cars in one day. Insures safety by eliminating dangers of hand operation.

Speed in unloading cars, facilitating early release to the carrier, is another advantage claimed. Even though loose materials have become set or frozen, truck power is adequate to open the car-bottom gates. Elwell-Parker Electric Company, Cleveland.

Anchor Type Nuts

Anchor type nuts, designed to provide vibration-proof fastenings for removable plates used to cover hand holes, access



What's your outlook for '42?

MILLER-IVANHOE asks...

- **Has defense put your plant on night work?**
- **Do you have to hold high precision on subcontracts?**
- **Impossible to get trained "help" and new machines?**

PRIME CONTRACTORS AND SUBCONTRACTORS:

There is no excuse for being "slowed down" by poor lighting today. Not when you can have 50 foot candles or better in your plant with IVANHOE "50 FOOT CANDLER", IVANHOE "100 FOOT CANDLER" and MILLER TROFFERS for your office — the *original* continuous wireway fluorescent lighting systems.

Five years ago you couldn't buy this grade of "seeing" at any price. Today it will cost you a small fraction of a cent per man-hour . . . to return greater and better production measured in dollars.

In case after case . . . in defense plants of all kinds, large and small, handling a wide variety of products . . . and under varying conditions, these guaranteed continuous fluorescent lighting systems have actually *proven* their ability to deliver these benefits. Today lighting experts pronounce them "*the new lighting standard for industry.*" They can definitely help you. Wire for helpful facts.

Prompt Deliveries—Superlative Service

We are constantly striving to keep deliveries moving smoothly, fast and ahead of building schedules. And no major installation goes in without a Miller-Ivanhoe engineer on the scene . . . to live with the job until it is operating with maximum results for you.

IVANHOE "50 FOOT CANDLER" and IVANHOE "100 FOOT CANDLER" give:

HIGHER ILLUMINATION — 50 to 100 foot candles—for faster, better production—greater worker efficiency.

30 TO 50% LOWER INSTALLATION COSTS —Fixtures contain up to 80% of necessary conduit—make defense dollars go further.

FASTER INSTALLATION — Steps up building schedules —plants get into production quicker.

UNIFORM LIGHT DISTRIBUTION — Production equipment can be moved at any time without necessity for changing lighting.

SIMPLIFIED MAINTENANCE — Easy to clean, removable porcelain-enamel reflectors—save valuable man-hours for production.

ALLOWANCE FOR FUTURE LIGHTING NEEDS —Illumination increases up to 45% practical without new fixtures—lower obsolescence.

THE MILLER COMPANY

MERIDEN, CONN.

Pioneers in Good Lighting Since 1844

● MILLER OFFERS A COMPLETE LINE of incandescent and fluorescent lighting equipment, backed by almost 100 years of commercial and industrial lighting specialization. There is an answer to your problems in this *unbiased* lighting service

Rapid initial installation, **equally fast relocation, feature every "Transite" office. Any type partition is easily formed—free standing, ceiling high, bank screen, solid or in combination with glass.**

End delay in building plant offices . . .

USE J-M TRANSITE WALLS

TO meet the call for speed plus adaptability in factory office construction, plant operators find J-M Transite Walls the ideal material.

The simple construction method permits unusually rapid erection with a minimum of dirt and disturbance. Quarters are solid, private and permanent, for Transite Walls are made of asbestos and cement. This means unusual durability, fire-retardance, continued low maintenance. And when changes are necessary, offices can be quickly moved or rebuilt with complete salvage of the original Transite Walls.

Two types of Transite Walls are available . . . Imperial and Universal. For full details on both, write for brochure TR-22A. Johns-Manville, 22 East 40th Street, New York, N. Y.

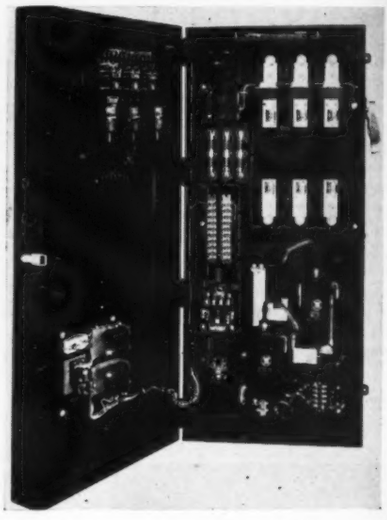
JM Johns-Manville

TRANSITE MOVABLE ASBESTOS WALLS

and inspection openings, and for other blind mount attachments, are permanently riveted to the inside of the structure. Bolts, which are inserted from the outside, pass first through the removable plate, thence through the structure into the stationary nuts. Offered in a wide range of size, material, and thread system, all incorporating the basic self-locking collar which is an integral part of each nut. Elastic Stop Nut Corp., 2332 Vauxhall Rd., Union, N. J.

Power and Control Units

Complete power and control units for resistance welding—including, in one compact cabinet, contactors and firing relays, sequence timer, protecting fuses, limit switches, motor starter, low voltage transformer, and relay. Eliminate the necessity for multiplicity of separate control units and all external inter-unit wiring requirements. Only simple wiring is required to connect the complete set of controls to the machine, while three-wire connections are made to the 440- or 220-volt power supply circuit.



Available for any type of welding equipment. Additional advantages include a lower installed cost than for separate units, and the insurance of "factory-wired" circuits throughout. Thus the units are available with a wide variety of contactors, ranging up to 600-amp. capacity, with synchronous and non-synchronous timers.

Cabinets are provided with external brackets for easy wall mounting without disturbing any units within the cabinet. Weltronic Corp., Detroit.

Respirator

Dustfoe respirator features single filter, all in one piece, which gives U. S. Bureau of Mines-approved protection against a broad range of dusts and mists. Filter is more porous on the outer side, so that the larger dust particles are filtered out first, thus preventing rapid build-up of breathing resistance through clogging of filter.

A protective cover prevents contamination of filter by grease and dirt from

Bottleneck Breaker!

OSTER

NO. 601 TURRET LATHE

A New **SIMPLIFIED** *Machine*

HOW QUICK DO YOU WANT IT?

The Oster No. 601 bar and chucking machine equipped with hand lever-operated six-position turret. Capacity of automatic chuck: round bar 1¼-inches, Swing: 14 inches, over bed: 6¼ inches over cross slide.

Crack down on machining bottlenecks! Get going with this new SIMPLIFIED, versatile, easily operated OSTER turret lathe! When can we deliver? Months ahead of more complicated, higher priced machines that demand more highly skilled set-up men and operators.

Varying set-up arrangements and conditions are met rapidly by the hand lever-operated six position turret. Shift from long-run to short-run schedules; change from bar stock and collet chucking to jaw-chucking; keep production moving; *break those bottlenecks!*

You get the No. 601 to meet *YOUR* requirements: with the six-position turret or with plain saddle, arranged for single tool post or other fixture. Also, you can have the No. 601 with WORM drive or DIRECT drive.

Certainly you want more details before you say "O. K." to this machine. Ask us for Catalog 27-A. It will help *us* to help YOU if you tell us your exact range of job requirements.

THE OSTER MANUFACTURING COMPANY

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GET GOING AND KEEP GOING FASTER WITH AN OSTER

are important in

NATIONAL DEFENSE

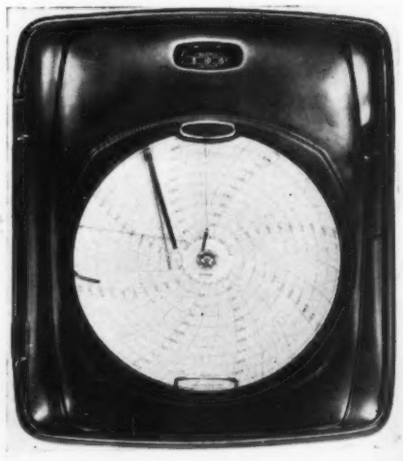
ESTABLISHED 1862
THE LUNKENHEIMER CO.
"QUALITY"
CINCINNATI, OHIO, U. S. A.
NEW YORK CHICAGO
BOSTON PHILADELPHIA
EXPORT DEPT. 318-322 HUDSON ST., NEW YORK

hands and equipment. A foolproof exhalation valve provides drainage. The formable facepiece can be shaped to fit individual face contours.

Can be completely disassembled without tools in a few seconds; every part is interchangeable, and, except for the filters, can be washed and sterilized. Inexpensive single throwaway filters permit a fresh, new filter with each cleaning. Mine Safety Appliance Company, Braddock, Thomas and Meade Sts. Pittsburgh.

Controller

Model 30 Stabilog controller, when panel-mounted, extends only ¾ inch from the panel surface. Door is recessed; hinges and hasp are flush with the door surface. A dual pressure indicator is easily seen through a rectangular opening in the door. Interior illumination can be pro-



vided. All operating adjustments are made from front of case. Instruments has three functions: Proportional function, providing uniform pneumatic proportional action, adjusted to the smallest value that will result in stabilization following a disturbance of process conditions; reset function, the secondary adjustable controlling function, acts simultaneously with the proportional function, establishing stabilization at the desired point of con-

"WE WERE ABOUT TO BUY TWICE TOO MANY FILTERS . . .
Till Cuno Ended the Production Pause That Depresses Profits"
1 Wheel-shaped discs are stacked on a central rotatable shaft.
2 Discs are held apart by spacers conforming in shape to discs but without rim.
3 Cleaner blades stacked on stationary rod extend into slots between discs.
4 Fluid containing solids enters casing here . . . must pass between discs.
5 Solids larger than space between discs are retained on outer edges.
6 Turning handle by hand or motor causes discs to rotate past stationary cleaner blades.
7 Rejected solids fall to bottom of sump . . . drained when convenient.
8 Filtered fluid passes out here.

They Keep on GO — Due to Cuno

Newspaper press—grease used as a bearing lubricant is cleaned by a Cuno Filter. *Cigarette-making machines*—a Cuno Filter protects water spray nozzles of humidifiers. *Tire-molding tubes*—Cuno Filters remove rubber particles and pipe scale from hot water.

"We were losing money every time we had to stop to clean our filters. Faced with a demand for steady output, we *thought* there were only two alternatives: (1) spend money on costly duplex installations, or (2) increase troublesome labor time by periodically replacing throw-away type filter elements.

"But Cuno Engineering eliminated the entire problem. The Cuno Auto-Klean Filter is cleanable while at work—automatically with a motor, or manually with a flick of the wrist. So, now we get continuous flow of clean fluid."

You, too, can insure top cleaning efficiency — with no maintenance or replacement problem — by installing Cuno *continuously cleanable* filters.

Write for FREE booklet, "80 Ways to Make More Money," describing the wide variety of Cuno filtering and straining applications.

CUNO ENGINEERING CORPORATION
612 South Vine Street, Meriden, Conn.

Please send me, free, "80 Ways to Make More Money"

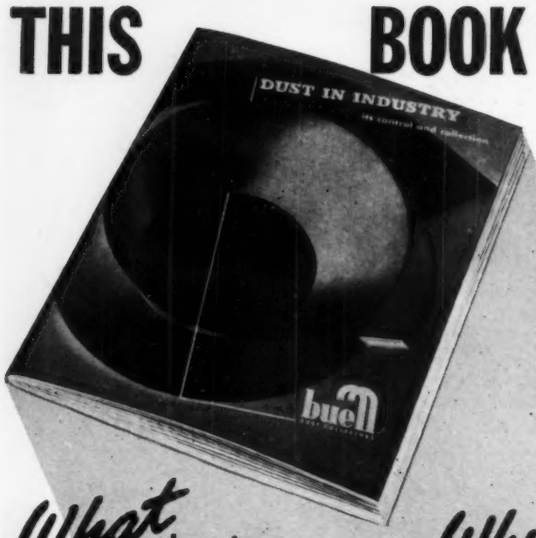
Name .....

Company .....

Street .....

City ..... State .....

THIS BOOK TELLS...



What dust is...
in terms of both theory and practice in industry.

Where dust originates...
in the many operations of industry, such as crushing, combustion, drying, grinding, mining, powdering, roasting, sand blasting and many others.

How Buell Dust Collectors can help your business...
through the high collection efficiency of the van Tongeren System (exclusive with Buell) and the low cost of both installation and operation.

Why dust control is important...
in terms of valuable dust that may be reclaimed and reworked, and in the elimination of hazards and hindrances to production.

Who buys Buell equipment...
the great names among America's industrial leaders who have bought—*and re-ordered*—Buell Dust Collectors for a wide range of uses.

Your copy of "Dust In Industry" will be sent upon request, without obligation. Have your secretary ask for Bulletin FA-12.

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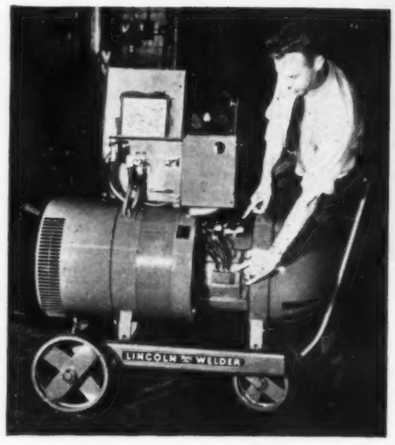
DUST COLLECTORS

BUELL ENGINEERING CO., INC.
12 Cedar Street, New York
Nation-wide service through offices of either Buell Engineering Co. or B. F. Sturtevant Co.

trol; third function provides a temporary additional correction, determined by the rate of change in any disturbance of conditions. If the rate of change is fast the additional correction is large; if the rate of change is slow the additional correction is negligible. Operation of this third function is entirely automatic, being governed by the proportional and reset adjustments. The Foxboro Company, Foxboro, Mass.

Protective Control Device for Welding Sets

Protection against overheating or excessive current, or both, is provided by a recently announced protective control device for arc welding machines.



According to the manufacturer a welding machine equipped with this device, which provides protection against burnout, can be operated at maximum capacity for long periods without harm.

It consists of two current transformers, whose primaries are connected in series with the motor leads, the secondaries supplying power to operate two snap-action thermostats that are mounted directly on the motor lamination. Thermostats are connected in such a way that they operate by means of heat conduction as well as by current passing through the thermostat.

The thermostats automatically reset when the motor returns to a safe operating temperature or when the current is reduced. No manual operation is required.

A special circuit allows the starter button to be held "in" after the welder thermostats have been tripped. This allows the machine to rotate with no load and the welder ventilation speeds cooling the welder after trouble has been rectified. The Lincoln Electric Co., 12818 Coit Rd., Cleveland.

Lubricator

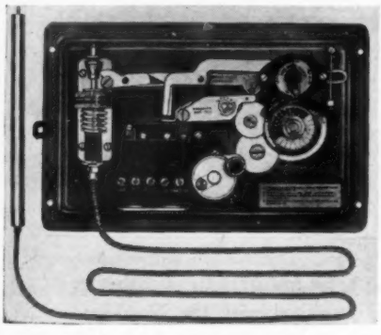
Sight-feed lubricator for air-driven equipment operates successfully regardless of its position in the line. Because lubricator has no baffle, it can be turned to any position convenient for visibility.

Another feature claimed is that it requires only one regulating valve. Oil is added by removing a screw plug at the

top of the lubricator. Lubricators are installed in an ordinary tee in air line. Made in 4/5 pint and quart sizes. Can be regulated to drop as few as 5 drops of oil per minute. The Roto Company, 145 Sussex Ave., Newark, N. J.

Heating System Regulator

Heating system regulator, which controls heating in accordance with outside temperature, and which programs heating according to the hours of activity, has recently been announced. Known as the Model 7 Tri-trol-Regulator, it offers in one instrument all controls and switches necessary for completely automatic heat regulation.



Regulator automatically changes the starting time of the system each morning in accordance with changes of outside temperature. During the day it operates the system often enough, and long enough—as guided by outside temperature—to maintain even, comfortable inside temperature. At night it shuts down the system, automatically, in accordance with the outside weather. Marsh Tritrol Company, 600 S. Michigan Ave., Chicago.

Coolant Pump

Features claimed for the portable coolant pump, easily attached to any machine tool, include portability, ease of control of coolant flow (from a drop to

FEROCIOUS ON FIRES—

yet COMPLETELY HARMLESS to materials and equipment

Here are the PLUS values in fire-fighting

1. LUX carbon dioxide gas is one of the fastest known extinguishing agents.
2. LUX extinguishers are effective on both electrical and flammable liquid fires.
3. LUX gas is clean, non-damaging, non-contaminating, non-toxic.
4. 45,000% expansion drives LUX gas throughout fire area, despite obstructions.
5. Annual recharging is not necessary with LUX. Simply weigh periodically.
6. LUX service depots are maintained in principal cities.

DID you ever see a fire put out and wonder if the extinguisher didn't do more damage than fire itself? If everything's soaking wet, if materials have been contaminated, "extinguisher damage" is costly.

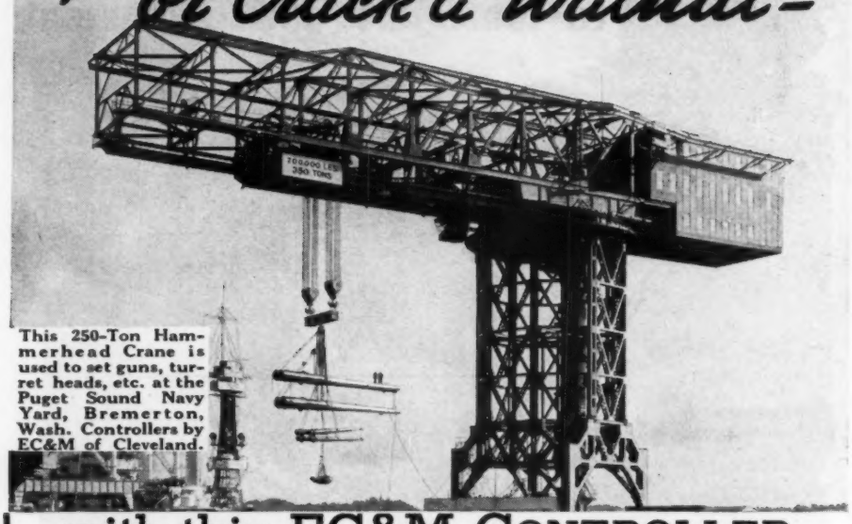
You don't have this problem with LUX carbon dioxide extinguishers. Though LUX is brutal to fires, it is gentle as a kitten to materials and equipment. LUX gas is completely dry, completely clean. LUX won't harm delicate mechanisms, won't contaminate materials in process.

Here's another fire fighting *plus* you get with LUX portable extinguishers, LUX built-in systems. LUX *does no damage*—yet it is sure death to fires. Make no mistake about *that!*

SNUFFS OUT FIRE

Walter Kidde & Company
Incorporated
1212 West Street, Bloomfield, N. J.

You Can Set a Gun or Crack a Walnut—



This 250-Ton Hammerhead Crane is used to set guns, turret heads, etc. at the Puget Sound Navy Yard, Bremerton, Wash. Controllers by EC&M of Cleveland.

with this EC&M CONTROLLER

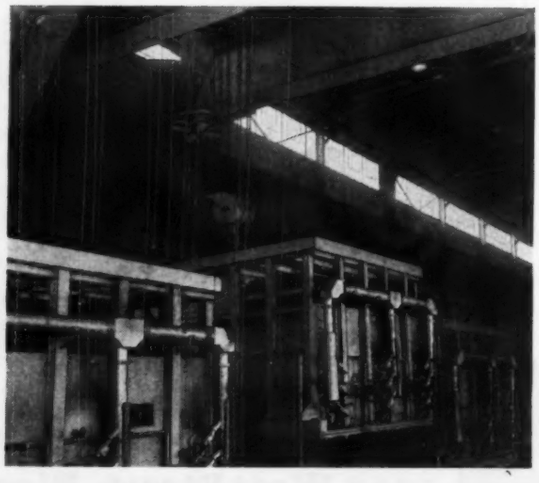
Of course, operators don't use cranes to crack walnuts but this statement expresses the fine degree of accuracy you have in an EC&M Magnetic Controller for hoist motions of cranes. Under any load condition, this controller is unequalled in its ability to permit short, accurate, inching movements.

And equally as important is the ability of this controller to permit lowering of light loads or the empty hook at high speed . . . thereby permitting more trips per minute. Substantial power savings are also obtained with this EC&M Crane Controller.

For accuracy, low up-keep cost in controlling both large and small cranes, consult EC&M-specialists in crane control problems.

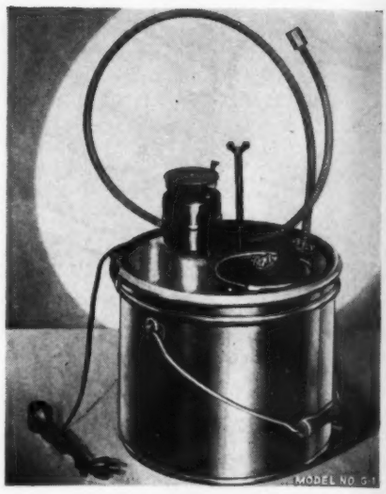
Magnetic Crane Controllers are described in Bulletin 921, Manual-type Controllers in Bulletins 960 and 980. Write for your copies. The Electric Controller & Mfg. Co., Cleveland Ohio.

Steel Mill Crane, EC&M Controlled, setting annealing furnace-top accurately in position.



THE ELECTRIC CONTROLLER & MFG. CO. CLEVELAND, OHIO

HEAVY DUTY MOTOR CONTROL FOR CRANES, MILL DRIVES AND MACHINERY • BRAKES • LIMIT STOPS • LIFTING MAGNETS AND AUTOMATIC WELD TIMERS.

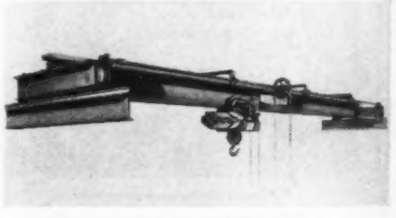


full stream), capacity to withstand continuous operation, ease of replacement of wearing parts, ability to handle coolants of all but extreme viscosities, an easily cleaned strainer.

Pump, which comes with all necessary fittings to attach it to the machine tool plug into the electric line and put it into operation, is designed for drill presses, lathes, tappers, cut-off saws, grinders, abrasive finishing machines, and small mills. Gray-Mills Co., 215 W. Ontario St., Chicago.

Electric Hoist Cranes

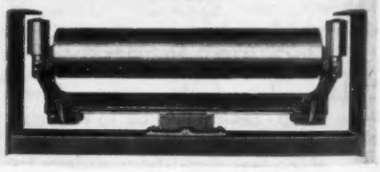
Electric hoist cranes, for auxiliary use in large plants or main hoisting in smaller plants, are easy to handle, built in various capacities up to those large enough to move 15-ton loads. Types available include top-running or underhung, hand or motor-traveled bridges and hoists, transfer types, special double-hook types. Cab con-



trol is furnished where desired. All cranes are furnished with the Northern Hi-Lift Hoist, a low-headroom hoist that gives long hook lift and provides positive control and safe handling. Northern Engineering Works, Detroit.

Self-Aligning Idler

Swiveling, positive, self-aligning idler for automatically correcting misalignment of either carrying or return runs of non-reversing conveyor belts supported on



• *Above view shows 12-inch Nicholson Mill Bastard used to remove heavy burr raised in drilling set-screw hole for locking booster in shell. Also used on cut-off operations (see right).*

must be uniform...files must be right for the job

THERE must be no compromise with maximum effectiveness in your Uncle Samuel's defense equipment . . . no faulty weapons—no faulty shells to jam our guns, go wild or fail at contact. There must be good tools to support the skill of the hands that make them.

Here are pictured four hand-filing operations in a munitions plant in the manufacture of 3-inch anti-aircraft shells. The files being used are Nicholson.

Because of their consistently high qualities for fast and accurate work —and because there is always available *The right file for the job*—hundreds of thousands of Nicholson and Black Diamond Files are "entering the service" each week.

They're in the Army, Navy, Air Forces . . . in the field and at sea . . . in shipyards, ordnance works, munitions plants, aircraft factories. They're at work in every kind of direct or indirect defense industry requiring the use of files. They're justifying again the reputation they've won through 77 years of peace and war-time history!

Filing burr off rotating band seat with a 10-inch Nicholson Mill Bastard.

Removing slivers from edges of machined rotating band with a 12-inch Nicholson Knife File.

BRASS FILES—For the wide demands of defense and other industries, there is a specially designed Nicholson or Black Diamond Brass File. Short-angle upcut and long-angle overcut enable both fast metal removal and smooth finishing. Sharp, high teeth bite deep with very little pressure; fine overcut produces small scallops and enables file to clear itself readily. *At your mill-supply dealer's.*

LET'S GO! U.S.A. KEEP 'EM FLYING!

FREE TECHNICAL BULLETINS on special Brass, Aluminum, Stainless Steel, Foundry, Die-cast, Die-makers, Shear Tooth and Long Angle Lathe Files. *Write us for your copies.*

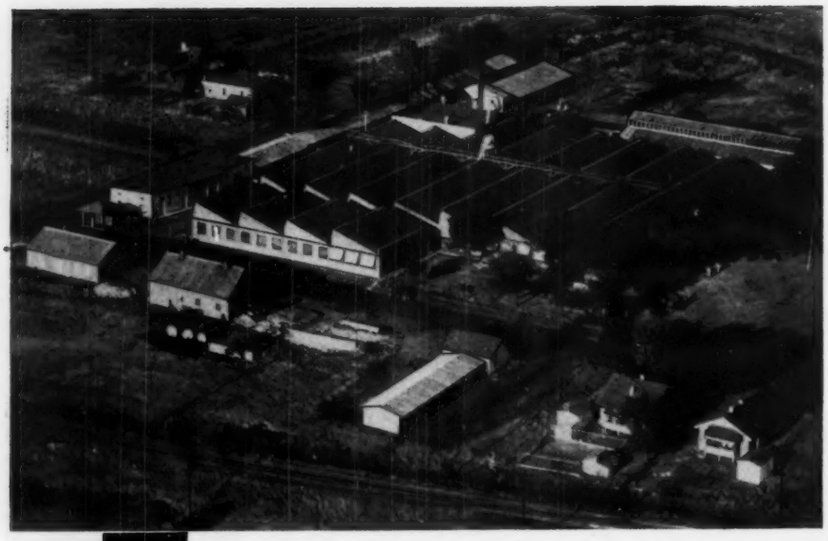
NICHOLSON FILE CO. • PROVIDENCE, R. I., U. S. A.

(Also Canadian Plant, Port Hope, Ont.)

NICHOLSON FILES

FOR EVERY PURPOSE

NICHOLSON U.S.A. MADE IN U. S. A.



For SALE

COMPLETE INDUSTRIAL PLANT AT INDEPENDENCE, KANSAS

DESCRIPTION

Property consists of 5½ acres of level land. Served by city sewers; has city water. Has a switch from Missouri Pacific Railroad running entire length of property. Has ample parking space, city fire protection, and considerable area for future expansion.

Main building is 200' x 241' x 13' high. Included is a complete 300 H. P. boiler plant, 250 K. W. generator, water-softener, electric wiring, water, gas and air pipings.

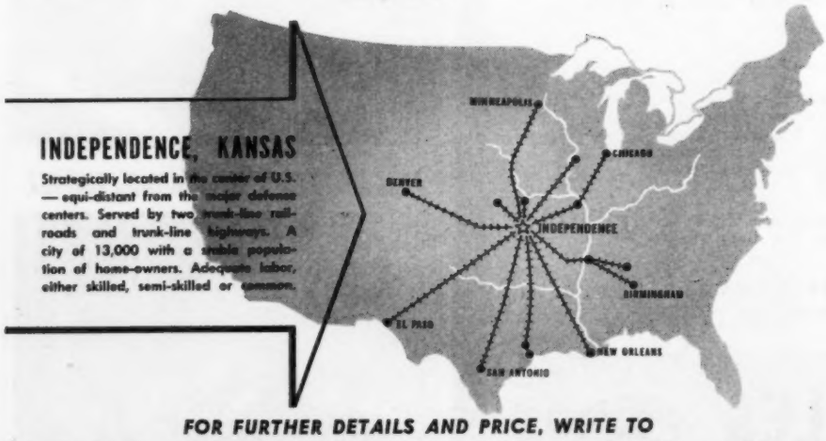
Is located in a home-owning community of 13,000 with an abundance of skilled, semi-skilled and common labor. Taxes are favorable, and labor rates lower than in larger cities.

Plant and property available for inspection.

Here's a complete, ready-to-go industrial plant — priced to sell at a bargain! It's in good condition, ready for immediate occupancy.

Suitable for manufacturing or assembly operations. Main Building is one-story, sawtooth, size 200' x 241' x 13' high. Walls of poured concrete, continuous north lighted windows, 6" concrete floor on solid earth. Has heating plant, power plant, plumbing, power and light wiring. Is protected by sprinkler system.

Will sell for a small part of present-day cost.



INDEPENDENCE, KANSAS

Strategically located in the center of U.S. — equi-distant from the major defense centers. Served by two trunk-line railroads and trunk-line highways. A city of 13,000 with a stable population of home-owners. Adequate labor, either skilled, semi-skilled or common.

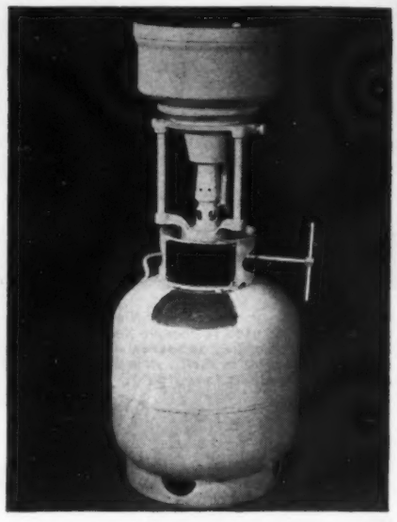
FOR FURTHER DETAILS AND PRICE, WRITE TO

W. G. Koch, 1321 Edgar Street, Evansville, Indiana, Phone 6201 or J. E. Searle, 20th and Sycamore Sts., Independence, Kansas, Phone 538

flat-roll idlers, is announced. Idler has a centrally pivoted cross member which, besides being equipped with a flat idler roll for supporting the belt, has a vertically mounted actuating roll at each end for lightly contacting the edge of the belt when its lateral misalignment exceeds a predetermined amount. Link-Belt Co., Indianapolis.

Gas Furnace

Unusual fuel economy is claimed for the Insto-Gas furnace. New design furnishes a windshield or flame guard to permit holding hot metal at a low flame, even on windy or cold days.



Economy of the new design comes from the prevention of heat dissipation before the flame reaches the melting pot, as the flame guard reaches down over the nozzle of the furnace burner. Insto-Gas Corp., 1900 E. Jefferson, Detroit.

Dry Lubricant

A lubricant that it is claimed will not contaminate food and which, through the use of colloidal graphite, retains its full lubricating qualities at high temperatures where oil will not remain liquid is announced.

Designated as Kano Ovenoil, lubricant depends for its action on the creation of

ARE DESIGNED, BUILT AND TESTED AS *Complete* UNITS

Hundreds of installations in widely diversified industries have proved the outstanding advantages of Westinghouse Gearmotors for slow speed drives. Gearmotors save installation costs and reduce maintenance expense because no belts, pulleys or sprockets are required. The exact output speed can be obtained by simply installing one unit. And with a Westinghouse Gearmotor, low output speed is provided with the full efficiency of a high speed drive—efficiency ranging from 94% to 98%.

The design and construction of Westinghouse Gearmotors make it possible to solve many slow speed drive problems economically. Westinghouse Gearmotors are built as one complete unit. The result is a balanced drive in which all parts are matched to provide maximum results. Smooth, quiet operating gears are assured because Westinghouse makes its own gears—gears that are accurately cut from forged steel and heat-treated by the exclusive Westinghouse BPT process.

Built as one complete unit with all parts accurately balanced and matched, a Westinghouse Gearmotor will deliver its full torque under load and withstand the shocks of even the most severe service conditions.

Gearmotors are available in all standard motor ratings and in a wide variety of special enclosures. Your Westinghouse representative will be glad to give you complete details.

• • •

WESTINGHOUSE ELECTRIC & MFG. CO.
EAST PITTSBURGH, PA.

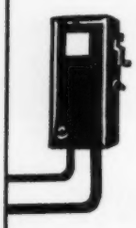
J-07171

Westinghouse
GEARED DRIVES

Bill-- Here's a tip to help you get that new plant operating sooner

"We've found that we can save as much as 50% of the time required for installing control by using G-E combination starters for the motors in our plant." ★

HERE'S WHY G-E COMBINATION STARTERS CAN BE INSTALLED MORE QUICKLY



THIS	Instead of	THIS
1	Devices to mount	2
2	Lengths conduit to cut	3
2	Conduit ends to thread	4
6	Wires to pull	9
6	Power connections to make	12

★ *Statement by R. L. Mitchell, master mechanic, Fernstrom Paper Mills, Inc., Pomona, Cal.*

GENERAL ELECTRIC

"graphoid" surfaces on moving parts in bakery ovens, which operate at temperatures of from 500 to 800 deg. F.

Ovenoil consists of colloidal graphite (produced by Acheson Colloids Corp., Port Huron, Mich.) suspended in an odorless carrier. This carrier burns off, leaving no carbon or gum residue. Its action is to deposit the tiny particles of colloidal graphite on the parts subject to wear. These particles have a strong affinity for metal and are adsorbed by the metal, providing a dry lubricating surface, commonly designated as a "graphoid" surface, capable of providing lubrication at temperatures up to 1,800 degrees.

Lubricant may be applied by spraying, mechanical oiler, or by brushing; comes in various size containers ranging from 1-gallon cans to 55-gallon drums. Norwood Products Corp., 75 E. Wacker Dr., Chicago.

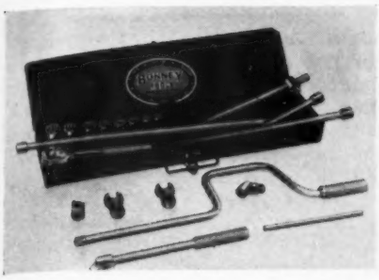
Furnace Inspection Door

A furnace inspection door, especially designed to withstand high temperatures, has recently been announced. Is applicable to various types of industrial furnaces, on heat-treating furnaces, and on boilers and kilns having continuous temperatures up to 2,500 deg. F. Consists of a cast-iron slide which rides vertically in a cast-iron frame assembly. Has no moving parts to warp and stick. When closed, slide

rests against the bottom of frame with its upper section, ribbed to dissipate heat, closing opening in brickwork. To open, slide is raised to bring a framed, rectangular piece of Pyrex heat-resisting glass opposite the porthole. Inspection door is easily installed on new or existing furnaces. Gillette Kiln Sales Co., 714 Investment Bldg., Pittsburgh, Pa.

Socket Set

Containing 20 strong, lightweight pieces for making practically any combination desired No. TD 12 socket set includes a full set of sockets with 5/16, 3/8, 7/16, 1/2, 9/16, 5/8, 11/16, and 3/4 inch



double hexagon openings; universal joint; 6, 12 and 17 inch extensions; ½ and 9/16 inch crowfoot attachments; 17½ inch speeder; drag link socket; 1½ inch hinge handle; 6 inch cross handle; 7 inch reversible ratchet, and 8 inch sliding "T." Packed in a strong metal box measuring 18x4½x1½ inches. Weighs 7½ lbs. Bonney Forge & Tool Works, Allentown, Pa.

Protection System for Roll Neck Bearings

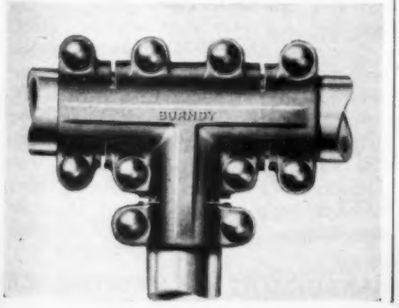
Higher rolling speeds in the steel industry mean higher temperatures. Should safe bearing temperatures be exceeded only for a short period, burnouts occur, resulting in expensive shutdowns. Brown protection system for roll neck bearings is designed to prevent such shutdowns.

Complete system consists of three essential parts: (1) temperature detection elements; (2) temperature recording system; and (3) signaling or alarm system.

System is claimed to provide a continuous, positive, and foolproof indication that the temperature of each bearing is within its safe operating limit; warn operators when any bearing exceeds its safe operating limit; indicate by signal light, on which roll stand the excessive temperature exists; show by chart record, which bearing in the stand is too hot; eliminate unnecessary roll changes due to high bearing temperatures because the operators are warned of the approach of such a condition before actual damage occurs; reduce the maintenance cost of roll necks because less re-machining is necessary; lengthen the useful operating life of the bearings. The Brown Instrument Co., Wayne & Roberts Aves., Philadelphia.

"T"-Connector

High copper alloy multigraph-type T-connector for tubing, run, and tap is slotted between bolts to provide independent high-pressure areas of contact. High-strength oval-shank bolts are in-



Thanks Joe . . . we're already using combination starters . . . they're safer

"We have found that our men can maintain G-E combination starters without danger, thanks to the safety-interlocked enclosure which separate units do not have."★

1 **SAFER** because the circuit switch has ample capacity to interrupt stalled-rotor current of the controlled motor.

2 **SAFER** because the cover can't be opened as long as the switch handle is in the ON position and power is applied to exposed parts.

3 **SAFER** because, whenever the cover is open, power can't be applied to the starter by accidental closing of the switch handle.

★ *Statement by Raymond Dingler, chief electrician of a large western cement plant*

Send for "How to Get More for Your Control Dollar" (GES-2456) General Electric Company, Schenectady, N. Y.

GENERAL ELECTRIC

MORE F[illegible]S [illegible]NG TO AMERICAN

AND MA[illegible]G A B[illegible]ER [illegible]RO[illegible]CT[illegible]% [illegible]AST

Plus!

Why do **YOU** *stick to old-fashioned fastening?*

"American PLUS Phillips Screws make a much neater appearance. And there's no possibility of the driver slipping off the screw head and breaking the glass."

—J. C. Montgomery, *Sales Manager*
Columbus Show Case Company

MANY TYPES OF PRODUCT GET TO MARKET FASTER . . . AT LESS COST

Time wasted by fumbled screws, crooked screws, screw driver accidents, split heads — is saved when you switch to American PLUS Phillips Screws. They cling to the driver — permit use of electric and pneumatic drivers. Send for free folders.

Genuine Phillips Recess . . . the PLUS on the Screw Means Less Cost to You

Write "American PLUS" in front of "Phillips" on your orders and benefit from

1. engineering service based on longest and broadest experience with Phillips
2. piece inspection insuring full quality, full count
3. Prompt shipment from largest stocks

There is an American PLUS Phillips Distributor in Your Vicinity

AMERICAN SCREW COMPANY

Providence, R. I. Chicago, Ill. Detroit, Mich.

WOOD SCREWS MACHINE SCREWS SHEET METAL SCREWS STOVE BOLTS

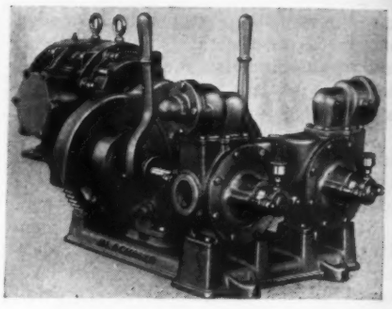
U. S. Patents on Product and Methods Nos. 2,046,343; 2,046,837; 2,046,839; 2,046,840; 2,082,085; 2,084,078; 2,084,079; 2,090,338. Other Domestic and Foreign Patents Allowed and Pending.

stalled with only one wrench. Connector combines the function of T-connector and coupler at a single point. Finished to provide minimum contact resistance. Sizes are available to accommodate from ⅜-in. IPS to 6-in. IPS on either run or tap. Aluminum and aluminum-to-copper combinations are available. Burndy Engineering Co., 459 E. 133rd St., New York.

Duplex Pumping Unit

Developed for use in bulk stations, blending plants, and refineries, 50-gal. duplex pumping units also have applications in the industrial field for handling naphtha, tar, printinv inks, and similar liquids and semi-solids. Useful where two different liquids are to be handled by the same pumping unit or where temporary higher capacity is required. May be operated as a single unit or both pumps may be operated together.

Pumps are standard bucket design (swinging vanes) with inlet chamber that permits the handling of liquids of great viscosity without lowering the volumetric efficiencies.



Can be furnished with or without removable liners, or, for extremely viscous liquids, steam-jacketed heads are available. Capacity: 50 g.p.m. per pump, 100 g.p.m. with pumps operating simultaneously. Pressure: 100 psi. with lubricating liquids; 75 psi. with non-lubricating liquids. Bearings: pumps for 75-100 lb. pressures are furnished with double-sleeve bearings. Pumps for 125-300 lb. pressures are equipped with antifriction bearings, either internal or external, depending upon the service. Blackmer Pump Company, Grand Rapids, Mich.

Fluorescent Industrial Fixture

"Three-Forty" fixture is made to accommodate three 48-in., 40-watt fluorescent lamps. The one-piece porcelain enamel reflector is finished in one ground coat and two white coats inside, ground coat and one gray coat outside. Hood of fixture is finished in light gray baked enamel. Can be furnished wired or unwired and includes sockets, lamp starters, and ballasts. Top is hinged and can be swung open to make all parts easily accessible for replacement or for making wire connections. Fixture is available for either chain or pipe suspension, but chain or pipe hangers are not included. Over-all

FROM THE *Ways* TO THE *Waves*—

MANHATTAN HELPS WITH "RUBBER" FOR *Ships*

Showing some of the rubber hose used in building a ship.

In the shipbuilding miracle that is about to reach an output of a ship a day, "rubber" plays an essential part.

As blueprints are being transmuted to metal at a pace that will produce a two-ocean navy months ahead of schedule, "rubber" is revealed not only as a critical material, but as a prodigy in its own right.

"Rubber" is not *one* material, but an array of materials, born of research and bred of experience in laboratories like MANHATTAN'S. Here, new compounds were pioneered, tested and retested and then proved in services where nothing else would do as well.

Natural and synthetic rubbers which resist oils, gasoline, salt water and chemical action have speeded the building, servicing and sailing of ships.

Hulls are welded, rivets driven, oil bunkers filled, engines are fed, channels are suction-dredged, vibration is dampened, submarine battery compartments are protected, propeller shafts rubber covered, salt water systems rubber lined, gun decks given foot security, exhausts in diesel-driven craft are almost silenced and given added years of life—all with rubber.

Hoists and cranes are controlled with asbestos friction material. Weld burrs and castings are ground smooth with abrasive wheels—rubber bonded and vibration dampened to reduce fatigue, to speed production.

A whole succession of improved or new products—pioneered and developed by MANHATTAN—is now "in training" for industry.

A Few of Many MANHATTAN Products for Ship and Yard

Porthole Rubber
Rubber Tiling
Packing and Gaskets
Fire Hose
Air, Steam, Water Hose
Welding Hose
Paint Spray Hose
Marine Exhaust Hose
Rubber Deck Coverings
Rubber-Lined Tanks
Rubber-Lined Salt Water Systems
Asbestos Electric Cable Insulation

KEEP AHEAD WITH MANHATTAN

THE MANHATTAN RUBBER MANUFACTURING DIVISION
of RAYBESTOS-MANHATTAN, INC.
EXECUTIVE OFFICES and FACTORIES . . . PASSAIC, NEW JERSEY

VITAL
"Air Wardens"
of INDUSTRY

PANGBORN Dust Collectors are silent sentinels standing guard over large and small industrial plants.

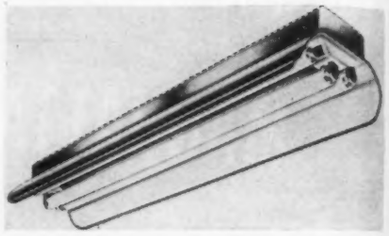
Wherever dust is produced they quickly, efficiently and economically collect it at its source—protecting your products, your equipment and your working conditions.

Don't fool yourself about DUST. It is a BIG problem in EVERY PLANT. Yet it can be CONTROLLED. For interesting data and bulletins "COME TO PANGBORN"—and get valuable facts about these vital "Air Wardens" of Industry. No obligation, of course.

PANGBORN

WORLD'S LARGEST MANUFACTURER OF DUST COLLECTING AND BLAST CLEANING EQUIPMENT

PANGBORN CORPORATION · HAGERSTOWN, MD.



dimensions of the fixture are 7¾ inches high, 13½ inches wide, and 52 inches long. Day-Brite Lighting Inc., 5411 Bulwer Ave., St. Louis.

Acetylene Cart

Gar-Bro Item No. 730-N acetylene tank cart has a total width of only 24 inches, enabling it to pass through any door or passageway; instead of carrying two tanks side by side, cart has one set behind the other, making possible the narrow width. Chassis is mounted on two large pneumatic-tired wheels with fully depressed hubs and 30x3½-in. heavy-

duty tires, so that the carts may be wheeled over rough, uneven ground or littered floors.

Either tank may be removed independently of the other, as the acetylene cylinder is inserted at front, while oxygen tank is placed in rear of cart. Frame is rigidly constructed of all-welded steel tubing, and is in balance at any angle. A broad, heavy, bottom plate rests flush on the floor when the tank is standing, for steady support. Steel tool box and two rod holders, for long and short rods, are attached to each cart. Garlinghouse Brothers, 2416 E. 16th St. Los Angeles.

Transmission

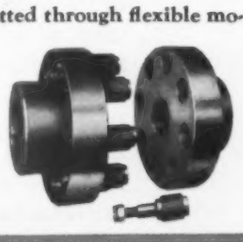
Transmission for use in meterizing cone-driven machine tools is compact, and, with the shifting lever moved into the main body of the transmission, more positive action is obtained. Designed for use with 1 to 5 hp. motors. Adapted to all kinds of machine tools with three

If your cranes screech and roar, you can be sure that vital parts are rubbing together—causing wear and expensive maintenance. Whiting cranes are known for their smooth, quiet operation. They have precision-cut herringbone gears which transmit power quietly and efficiently. They have heavy-duty roller bearings, tapered-tread drive wheels, oil-flushed load brakes, and many other features. That's why you get *extra* years of service with Whiting cranes. Capacities from one to 400 tons. Also electric hoists from ½ to 7½ tons. Whiting Corporation, 15689 Lathrop Avenue, Harvey, Illinois. *Builders of quality cranes for over 50 years.*

SEND FOR BOOKLET—"How to Write a Traveling Crane Specification"

FLEXIBLE COUPLINGS REDUCE NOISE AND WEAR IN WHITING CRANES

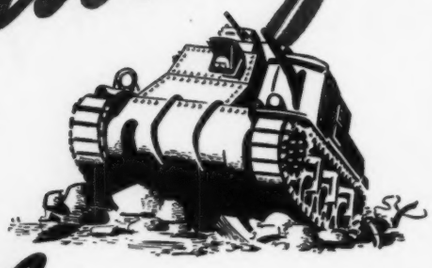
Motor torque is transmitted through flexible motor couplings, which cushion the shock of starting, eliminate strain on shaft bearings, and transmit motor power without noise or vibration.



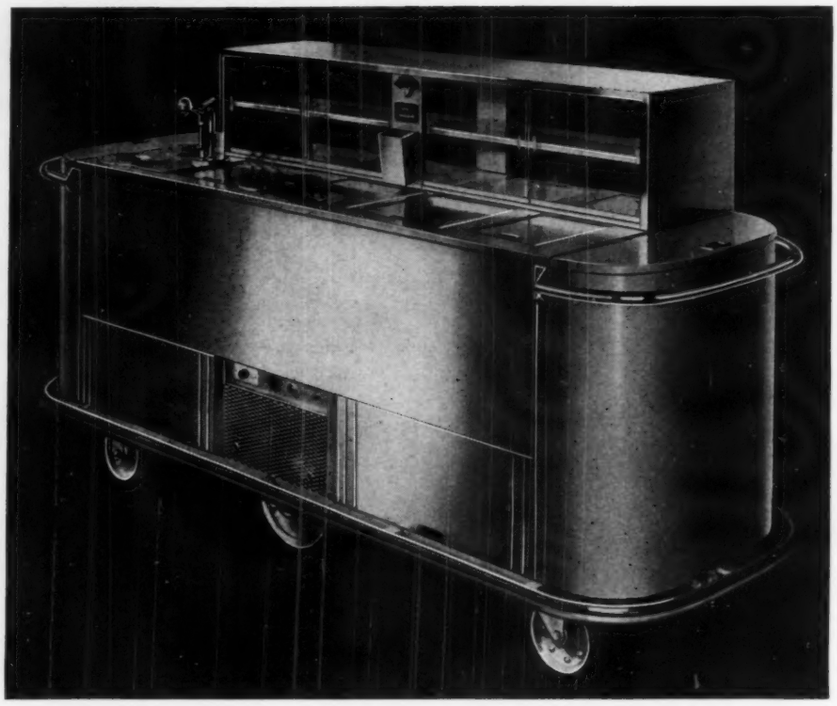
WHITING *Quiet-Running*

OVERHEAD TRAVELING CRANES

Mechanize



YOUR FOOD SERVICE WITH *Ideal* ROLLING CAFETERIAS



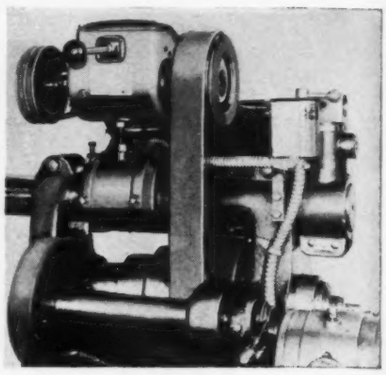
Model C-1030 is the latest Ideal Rolling Cafeteria serving both hot and cold foods, desserts, knicknacks on the spot. Many models meeting every individual need.

● No wash-up, no running for lunch, no waits for second table, no irritation at inconvenient and delayed food service in the plants that feed the men at bench and machine from Ideal Rolling Cafeterias. Save valuable space for production, avoid lunch-time accidents, cut feeding cost, raise the good spirit of the whole works with Ideal mobile food service units—as necessary to industry as tanks to the army. Write for booklet "Human Beings At Work" and get a graphic picture of the solution to your feeding problem.

THE SWARTZBAUGH MFG. CO.
TOLEDO, OHIO

DISTRIBUTED BY
THE COLSON CORP.
ELYRIA, OHIO

models of multi-motor mounting: (1) lathe bracket, also for meterizing automatics, bolt cutters, Fellows gear shapers, vertical milling machines, radial drills, turret lathes, screw machines; (2) shaper bracket, also for boring mills, vertical mills; (3) milling machine bracket.



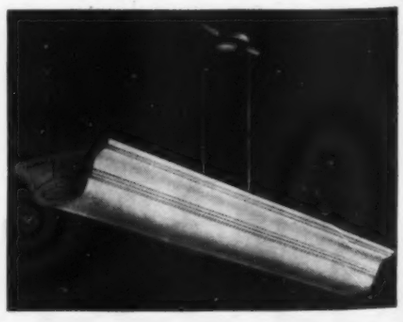
Built for heavy loads with transmission case and covers of semi-steel castings that are oil-leak proof. Gears and spline shafts are of alloy steel, accurately machined, heat-treated, and ground. Revolving shafts are mounted on antifriction bearings. Moving parts run in an oil bath. Plugs are provided for filling and draining. Oil-seals are provided where necessary. Western Manufacturing Co., 3428 Scotten Ave., Detroit.

Fan Blade

Fan blade is constructed for quiet operation while moving an increased volume of air. Precision balanced to insure perfect alignment. Polished steel, die-stamped, and die-formed blades are riveted with five rivets for extra stability to the bolted arms. Polished hub is mounted over the fastening base. Available in sizes from 19 to 72 inches. Chelsea Fan & Blower Co., 1550 Grove St., Irvington, N. J.

Indirect Fluorescent Fixture

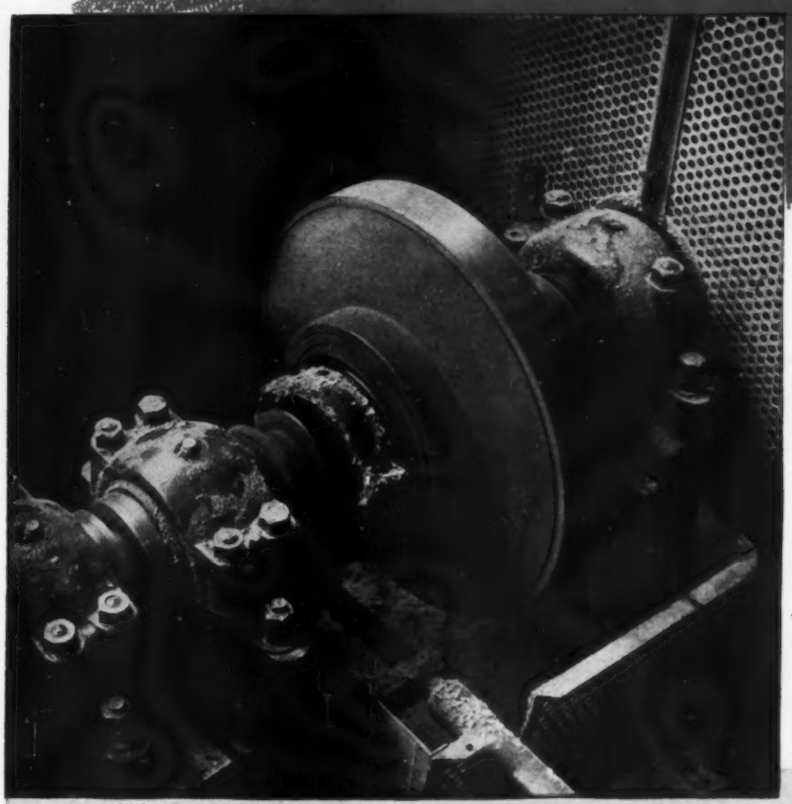
Flu-O-Indirect is a luminaire development designed to provide the quality and refinement of indirect illumination with efficient economical fluorescent light sources. Wide light distribution is made possible by shape of the reflector and the characteristic form of fluorescent lamps. Broad light spread eliminates "hot-spot" of light. Efficient light distribution permits wider spacings and makes the fixture suited for low-ceiling installation



You Pay the Same for Power - - Delivered or Dissipated!

Speed and Stamina

. . . NO. 1 SPECIFICATIONS TODAY . . .



BUT DODGE KNOWS YOU WILL WANT THEM TOMORROW, TOO!

Your choice of Dodge Diamond "D" Friction Clutches for speed and stamina equal to today's heavy loads will stand you in good stead tomorrow — when needs return to normal.

Built the Dodge way — Dodge Clutches are longer lasting because they are perfectly balanced — completely enclosed against destructive dirt — compact and self-locking — with an ample safety factor that permits momentary starting loads 100 per cent higher than normal rating.

For power transmission or machine application — Dodge Clutches deserve your preference.

DODGE MANUFACTURING CORPORATION
MISHAWAKA, INDIANA, U.S.A.

DODGE DIAMOND "D" FRICTION CLUTCHES . . . *Preferred* FOR THESE FEATURES:

- ***Powerful*** — ample safety factor to handle momentary overlocks as high as 100 per cent above rating.
- ***Compact*** — designed for extreme compactness without sacrificing horsepower capacity.
- ***Protected*** — fully enclosed against destructive dirt and dust and for added safety.

- ***High Speed*** — proper proportioning and accurate balance for continuous high speed operation.
- ***Simple Adjustment***—positive, convenient one-point adjustment.
- ***Smooth Operation*** — self-locking feature eliminates necessity for pressure to hold clutch in engagement.

DODGE
MISHAWAKA
Power Transmission

THE RIGHT DRIVE . . . FOR EVERY JOB

SWEEPS CLEAN!

U·S·S MULTIGRIP FLOOR PLATE is easy to keep clean—the scientifically placed, symmetrically designed risers leave no corners or pockets in which dirt can cling. This one feature alone adds to its safety value. U·S·S MULTIGRIP withstands the hard usage of heavy traffic—insuring longer life and lower cost. The projection and arrangement of the risers afford easy, unobstructed traction for wheeled vehicles. It's doubly safe underfoot, too.

U·S·S MULTIGRIP is available in wider widths than any other types of floor plate, permitting fewer joints and lower installation costs. Write today for actual samples and booklet.

U·S·S MULTIGRIP FLOOR PLATE

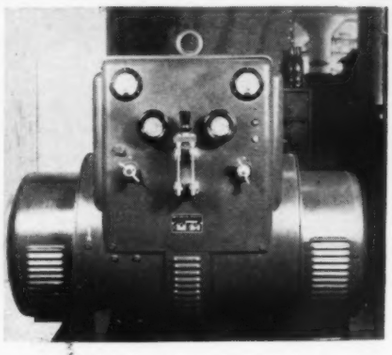
CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
TENNESSEE COAL, IRON & RAILROAD COMPANY, *Birmingham*
COLUMBIA STEEL COMPANY, *San Francisco*
United States Steel Export Company, New York

UNITED STATES STEEL

even when only a small drop can be used. Has a durable "300° white" inner reflector that affords high lighting efficiency. Stamped steel ends of the fixture are welded to the upper half of the luminaire, and the lower bottom of the fixture basin is easily removed for installation or servicing. Joined to the underside of the reflector are accessories for the two 40, 65, or 100 watt lamps which various sizes accommodate. Available with single or double stem hangers and can be mounted individually or in continuous rows. The Edwin F. Guth Co., 2615 Washington Blvd., St. Louis.

Anodizing Machines

Anodizing machines, available from 125 through 875 amp. at 20, 40, or 50 volts d.c., motor sizes range from 7½ through 55 hp., generating from 5 to 35 kw are announced. Each machine is furnished complete with control cabinet ready for anodic treatment of aluminum and its alloys, whether the Alumilite, Bengough-Stewart, or Bureau of Standards process is used in the operation.

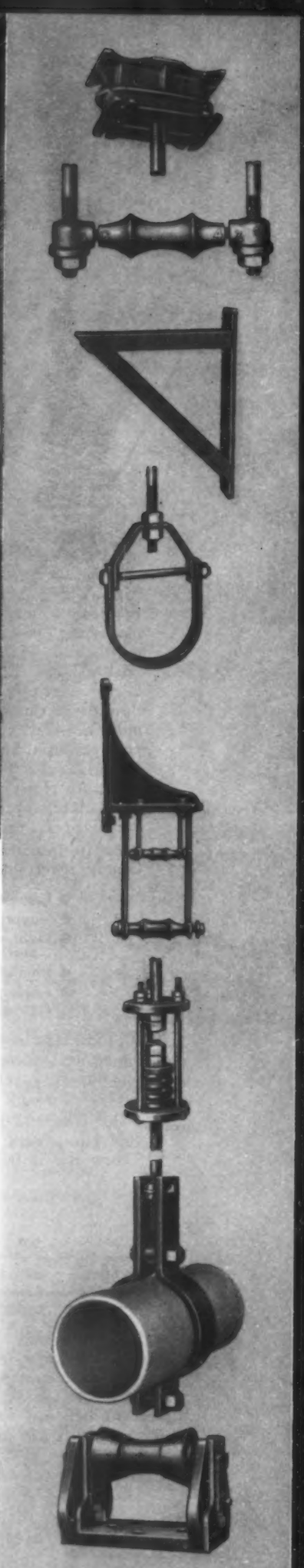


Features of the anodizing sets are: Constant speed, guaranteeing constant voltage and close control over the entire current range. Positive voltage regulation insures continuous capacity with high over-all efficiency. Compact single unit construction, antifriction bearing mounted.

Units are equipped completely with separate exciter; control cabinet housing an accurate reading ammeter with shunt-voltmeter; exciter and generator field rheostats; double-pole, single-throw work circuit switch; positive and negative terminal studs; and across-the-line switch giving overload as well as under voltage protection or release to the motor. Motor Generator Corp., Troy, Ohio.

Excavator

Type 70 excavator and materials handler is available with either conventional crawler mounting, or with pneumatic-tired wheel mounting. Rated as a 1¼ cu.yd. shovel or a 15 ton crane, it can perform the duties of a shovel, dragline, clam-shell, crane, pile driver. Features include air control, twin disk clutches, ability to lower heavy loads against the friction of the operating machinery and the compression of the engine; can be steered in any direction, without stopping the forward motion of



PIPE HANGERS *engineered*

for each specific service

Now you can get professionally-engineered pipe hangers for every job you have to do! No more makeshift hangers that take time and only do a half-way job . . . no sagging pipes and costly maintenance . . . Grinnell Pipe Hangers include types and styles to hang *any* piping *anywhere.* They're faster, stronger, more compact . . . and easily adjustable *after installation.*

Available through branch offices, wholesalers and heating and plumbing contractors everywhere. Write for complete catalog, "Grinnell Adjustable Pipe Hangers". Grinnell Company, Inc., Executive Offices, Providence, R. I. Branches in principal cities.

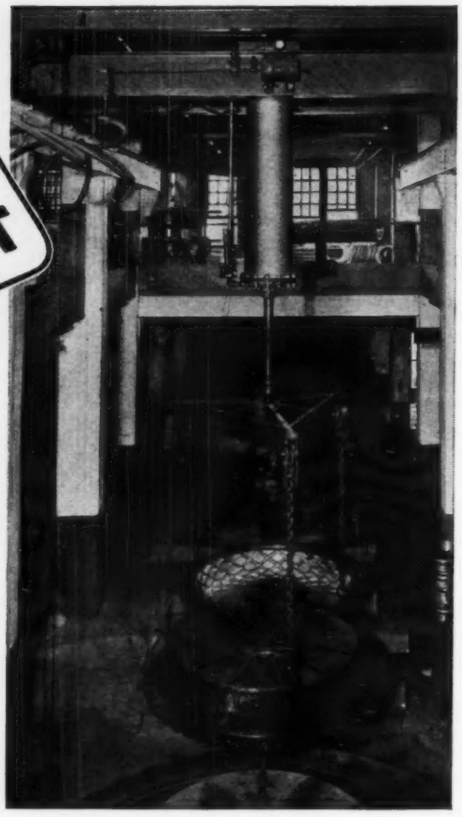
GRINNELL

WHENEVER **PIPING** IS INVOLVED

GOODYEAR

Solves a Production Problem With a

CURTIS Air Hoist



★As illustrated above, the Goodyear Tire and Rubber Company last year solved the problem of handling the movement of heavy tire molds and heater lids with a Curtis Air Hoist. Loads average 30,000 pounds with a maximum of 40,000 pounds per operation. Since the installation of this Curtis Air Hoist in 1940, no maintenance whatever has been necessary.

As in hundreds of industrial plants throughout America, Goodyear recognized the advantages of Curtis Air Hoists:

- **Low first cost—low operating expense**
- **Smooth, fast, accurate control of loads**
- **Light weight—available in pendant, bracketed, and rope compounded types**
- **Immunity to abuse or overloading**
- **Fewer production interruptions for servicing**
- **One man operation—by ordinary labor**

If production in your plant includes the hoisting of equipment or materials, it is more than likely that Curtis Air Hoists will speed up your work, release labor for other jobs, and lower production costs at the same time.

For complete information on Curtis Air Hoists and air powered equipment, send the coupon below for free booklet on "How Air Is Being Used in Your Industry."

CURTIS

ST. LOUIS • NEW YORK • CHICAGO • SAN FRANCISCO • PORTLAND

● Please send me your free booklet "How Air Is Being Used in Your Industry" and further details concerning Curtis Air Hoists.

CURTIS PNEUMATIC MACHINERY DIVISION
OF CURTIS MANUFACTURING COMPANY
1995 Kienlen Avenue, St. Louis, Missouri

Name.....

Firm.....

Address.....

City.....State.....

the machine; independent travel mechanism; independent boom hoist can be supplied. The Osgood Company, Marion, Ohio.

Voltage Regulator

The B-L voltage regulator, manually operated, is designed to provide a means for adjusting the voltage output of each individual or bank of rectifiers in electroplating units. Available in a wall mounting cabinet for installation adjacent to the plating tank, within reach of the operator and away from the rectifier units.

Has 64 steps of adjustment, giving a voltage range from maximum down to 1 volt. The coarse control covers the full range in 8 steps, while the fine control provides 8 steps for each step of the coarse control. Also provides a start-stop station permitting remote control for starting and stopping the rectifier. In the front of the unit are two accurate, easily read meters, sealed to protect against moisture and dust. One voltmeter and one ammeter record current and voltage of each rectifier. The Benwood Linze Co., 1815 Locust St., St. Louis, Mo.

Portable Water Tank Unit

Mobile water tank units are light in weight. Made in two models: One can be worn on the carrier's back, and the second is worn on the carrier's side. Both are made from lightweight metals and have adjustable shoulder straps, a paper cup dispenser, and standard faucet. Large

FOR THE BEST FLUORESCENT LIGHTING

THE BALLASTS ARE AS IMPORTANT AS THE LAMPS

CERTIFIED
E.T.L.
SPEC NO 6
HIGH P.F.

UL

CERTIFIED BY ELECTRICAL TESTING LABORATORIES

•

LISTED AS STANDARD BY UNDERWRITERS' LABORATORIES, INC.

Lamp design—electrodes, filling pressures, length, diameter, current density, voltage and current, etc.—is based on the best performance of lamps for efficiency, maintenance, life. These basic factors determine the units of electrical specifications for ballasts.

Because of these requirements, the fluorescent lamp manufacturers guarantee the performance of their lamps only when used with those ballasts which meet the specified performance, as tested by Electrical Testing Laboratories, other laboratories of recognized standing. This is a logical safeguard set up by the fluorescent lamp manufacturers to insure proper lamp performance.

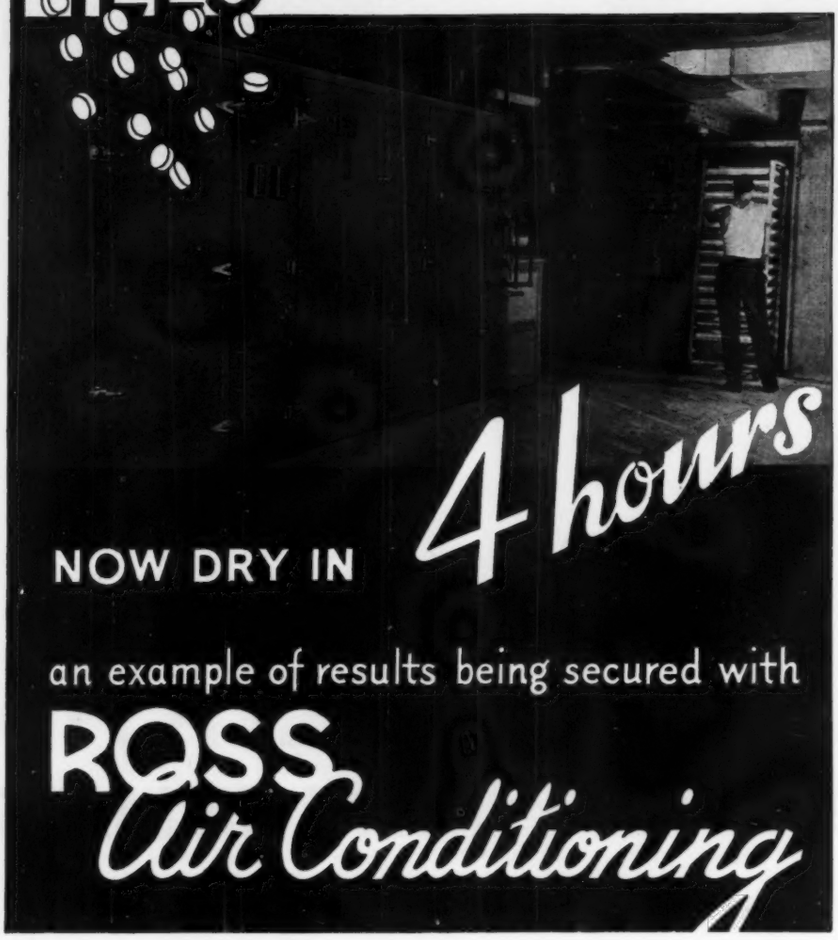
Underwriters' Laboratories' approval of equipment requires that the device meet established standards as far as fire hazard and danger to life and property are concerned. • Your self-interest and the ultimate satisfaction should prompt you to be sure you get Ballasts with the "E.T.L." Certification label or insignia stamped in the case.

● With the rapidly increasing use of fluorescent lighting it has become apparent that for best results, the Ballasts are as important as the lamps.

The fine performance attained in so many cases is due to the vigilance of the lamp manufacturers and the engineers and contractors who make the installations. They know the important role played by the Ballasts. The correctness of design, the thoroughness of construction electrically and mechanically, make Jefferson Electric Ballasts first choice by a wide margin . . . You protect yourself by specifying Jefferson Ballasts, always. JEFFERSON ELECTRIC COMPANY, Bellwood (Suburb of Chicago), Illinois. Canadian Factory: 60-64 Osler Avenue, W. Toronto, Ontario.

JEFFERSON ELECTRIC
FLUORESCENT LAMP BALLASTS

PILLS THAT USED TO TAKE 6 DAYS TO DRY....



NOW DRY IN *4 hours*

an example of results being secured with

ROSS *Air Conditioning*

Cutting down drying time from a whole week to a single forenoon obviously achieves a tremendous saving in costs of all kinds. Such savings quickly offset the expense of installing the proper equipment.

In the case of this drug manufacturer, Ross engineers designed new batch dryers equipped to not merely circulate hot air but to accurately regulate vapor pressure as well. Results were immediate.

Whatever your product or process, a Ross System for automatic control of both temperature and humidity can be designed to provide a more rapid and constant treatment of product or material along with uniform conditions that maintain unvarying quality.

Ross Systems embrace heating, high temperature baking, medium and low temperature drying, humidifying, dehumidifying, refrigeration, chilling.

Write for copy of this 20 page Bulletin No. 210. No obligation.

J. O. ROSS ENGINEERING CORPORATION

Main Office — 350 MADISON AVE., New York, N. Y.

201 North Wells St. CHICAGO, ILL.

12893 Greeley Ave. DETROIT, MICH.

ROSS ENGINEERING OF CANADA, LIMITED, Dominion Square Building, Montreal

mouth allows quick filling and easy cleaning. Both models can be had with a sturdy canvas jacket that has a hair-felt lining which serves as both insulation against hot and cold, and as a padding for the carrier's comfort. Universal Paper Products Co., 823 Wabash Ave., Chicago.

Drum Controller

Several interesting features are claimed for drum controllers for small cranes and hoists. Small and compact in size, these new drums have a rope operating lever, embodying an equalized torque principle that eliminates sheave wheel, rope guard, and external return spring, and provides smooth operation even when the rope is pulled at an angle. Anti-plug feature increases drum life by making it impossible to whip drum from full forward to full reverse position. Drum can be reversed quickly, but a definite time delay is required in the off position. Available in self-centering rope lever, self-centering, and non self-centering radial lever types, for 4 or 6 speeds. Cutler-Hammer, Inc., Milwaukee.

Pumpless Blow Torches

"Safety" blow torches use no pump and therefore introduce no air oxygen into the fuel tank. Torches obtain their pressure through the expansion and vaporization of the fuel in the tank by heat transmitted by a metal staybolt reaching from the burner to the fuel supply. This not only

acts as a safeguard against flash-back explosions within the tank, but also as a safeguard against excessive pressure being built up in the tank. A safety factor of between 28 and 29 is attained. Generates a heat reaching 2,400 deg. F. and can be used in any position. Davis & Murphy, 500 N. Dearborn St., Chicago.

Safety Relief Valve

Designated as No. 129 safety valve for hot-water heating boilers has discharge capacity to take care of boilers with gross B.t.u. output up to 350,000 per hour.

Relieving of normal expansion of water is comparatively simple, but at high temperatures far greater discharge capacity

"RAILROAD" YOUR LOADS ON SCHEDULE

With Correctly-Built Tractor Systems—One of 6 Distinct Types Built by Elwell-Parker

Your materials travel "on the main line"—with your plant as the railroad and with your material transfer points as way stations—when you equip with Elwell-Parker improved Industrial Tractors.

Trailers are the vital "attachments" that help you create profits with Elwell-Parker Tractors—just as rams, forks and booms increase the earning power of other Elwell-Parker equipment.

You can operate Tractors exclusively, or use them to effect still greater savings as part of carefully-planned *Systems* for transporting all your loads, all the way.

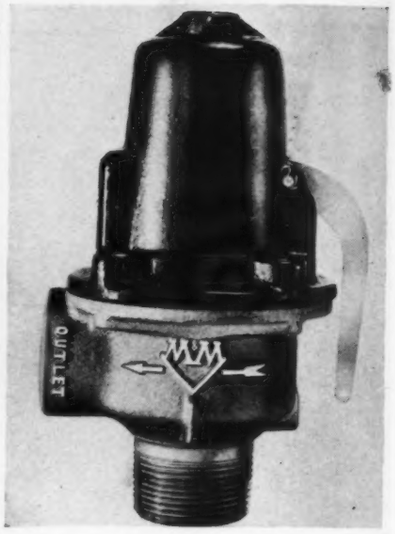
Platform Trucks, Lift Trucks, Fork Trucks, Cranes and Load Carriers provide a further wide range of Elwell-Parker Equipment for handling the typical loads of your industry with added volume and speed and with assured new economies.

The Elwell-Parker Electric Company, 4323 St. Clair Avenue, Cleveland, Ohio.

ELWELL-PARKER *Power Industrial* **TRUCKS**

ESTABLISHED 1893 • BUILDING POWER INDUSTRIAL TRUCKS SINCE 1906

Your
SAFEST
SHELTER
against "Raided"
Production
WHITNEY CHAIN DRIVES are armored ... in design, in manufacture and in tough alloy-steel construction ... against the usual raids by power-loss and wear. Whitney Chains deliver full power to keep machines up to top capacity, at constant speeds that protect product-uniformity. And if you have proper priority, you can now get the power priority of Whitney Positive Transmission for every machine drive. Write.
WHITNEY
ROLLER AND SILENT CHAINS
THE WHITNEY CHAIN & MFG. CO., HARTFORD, CONN.
WHITNEY PRODUCTS Roller Chain & Sprockets, Silent Chain & Sprockets, Conveyor Chain & Sprockets, Roller Chain Flexible Couplings, Automatic Load Limiting Sprockets, Automatic Drive Tensioners, Woodruff Type Machine Keys and Cutters.



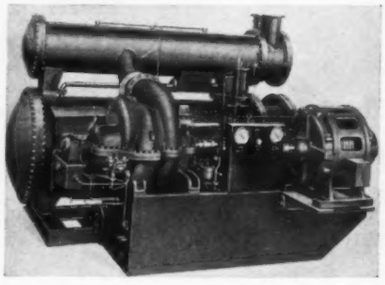
is necessary to prevent excess pressure. The manufacturer has provided this greater capacity by devising a snap-action mechanism which opens up full orifice capacity when the set relief pressure of 29 lb. is reached.

Other features include flexible, leak-proof bellows, which take the place of a diaphragm, and stainless steel metal-to-metal valve that replaces composition disk. An incidental advantage of the snap-action mechanism is the ease of testing operation. McDonnell & Miller, Wrigley Bldg., Chicago.

Cooling Systems

Line of liquid cooling systems for air conditioning and industrial process requirements features centrifugal compressor of the volute design.

Features include dual lubrication, balancing of end thrust and side thrust by arrangement of impellers and volutes. Systems are available in a variety of sizes from approximately 150 to 1,200 tons refrigerating effect. Worthington Pump & Machinery Corp., Worthington Ave., Harrison, N. J.



Variable Speed Control

A V-belt variable-speed transmission known as the JFS-CUB is especially designed for all "A" section V-belt applications and for speed ranges up to 3.3–1. Among the advantages claimed are: Patented positive belt alignment feature which makes possible mounting in any position without im-

THE "BIG GUNS" OF DEFENSE

SPEED PRODUCTION

With BullDog "Plug-in" Electrical Distribution

DAY BY DAY more defense contractors — making everything from battleships to eyelets for shoes and from bombers to army shirts—are equipping their new plants, or modernizing their old, with BullDog Flexible Electrical Distribution Systems.

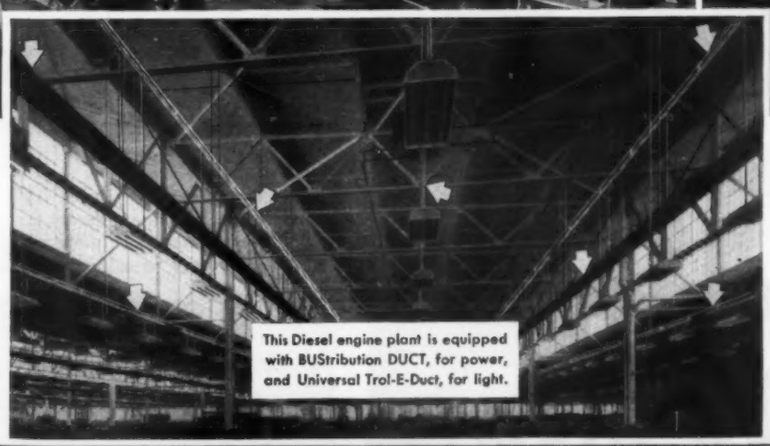
BullDog's "plug-in" Bus Duct systems are ideally suited to save precious production time for industry—to avoid wiring delays or delays in rearranging machinery and in planning new buildings. BullDog Bus Duct systems give *ready* light and power *anywhere,* permit "plug-ins" as simply as appliances in the home, and include various protective "plugs" for each individual machine.

There are three BullDog Systems — BullDog BUStribution Duct for *Power;* Universal Trol-E-Duct for *Light,* and Industrial Trol-E-Duct for *Production Lines* or *Assembly* Benches. They are used singly or in combination; are built in standardized, interchangeable sections; are quick and easy to install or to move from one position or one plant to another, and are completely salvable.

Write for Bulletins 403 and 412 describing these modern wiring systems. Better yet, ask for a call from a BullDog sales engineer — and ask him to show you the roster of hundreds of defense plants equipped with one, two or all three BullDog Systems.

BullDog BUStribution DUCT installation in a great new aircraft engine plant.

BullDog Industrial Trol-E-Duct both feeds and supports portable tools used on this airplane wing assembly line.



This Diesel engine plant is equipped with BUStribution DUCT, for power, and Universal Trol-E-Duct, for light.

BULLDOG
ELECTRIC PRODUCTS CO.
DETROIT, MICHIGAN
BullDog Electric Products of Canada, Ltd., Toronto, Ontario

MANUFACTURERS OF Vacu-Break Safety Switches, Circuit Master and SaFeFuse Panelboards, Switchboards, Duct Systems—FOR LIGHT AND POWER

A STATEMENT OF POLICY

ELECTRICAL wires and cables—supplies and equipment of every sort—are so desperately needed for National Defense that the temptation to speed production by lowering quality is ever-present.

We want to assure you that no such expedient will be entertained by Roebling. There will be no cutting of quality-corners for time-saving purposes. It is the definite Roebling policy to maintain the high quality of Roebling electrical wires and cables . . . despite the pressure for "speed at any cost".

Roebling believes that in upholding the high quality of these products, safe, uninterrupted service is assured—saving time and costly interruptions *in the long run.*

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, NEW JERSEY

ROEBLING
ELECTRICAL
WIRES AND CABLES

pairing function or throwing belts cut of alignment; machined and balanced cast-iron construction; forced lubrication of the special bronze bearings on which the pulleys rotate; free-end pulley spindle to permit easy installation of belts; both pulleys on one side of pivotal mechanism, which permits motor pulley and driven pulley to be almost directly in line with each other. Standard Transmission Equipment Co., 416 W. 8th St., Los Angeles.

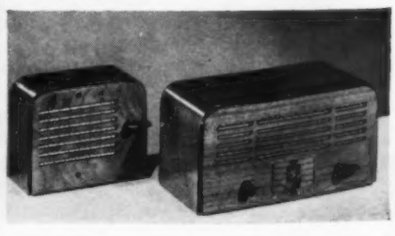
Defense "V" Light

Luminaire is claimed to be particularly effective in protective fence lighting systems. Main features are a deep shading

type reflector and a vertilateral refractor designed to control the light both vertically and laterally, thereby increasing visibility. Technically known as Form 79VR. General Electric Co., Schenectady.

Industrial Intercommunication System

Intercommunication system is engineered to meet requirements of diversified production methods of industrial plants. Offers privacy of conversation between



YALE ELECTRIC TRUCKS INCREASE HANDLING EFFICIENCY—SPEED THE DEFENSE PROGRAM

When a materials handling problem worries you, when you have a tough stacking, tiering, storing or transporting job, then put a Yale Electric Truck to work for you—and watch your troubles vanish.

For Yale Electric Industrial Trucks are designed to care for materials handling needs faster, better and at less cost!

By controlling the flow of materials, they speed production, eliminate wasted time and effort, increase handling efficiency.

Every Yale Truck is backed by nearly 75 years of manufacturing experience. They incorporate all the latest engineering advances to give them increased stamina, longer life, permit them to stand up under today's increased production demands.

There is a Yale Electric Industrial Truck for your every handling need. Let the nearest Yale representative tell you more about these modern production-speeding tools. Let him show you how Yale Trucks can cut your handling costs. Or, if you prefer, write to us for full information.

THE YALE & TOWNE MANUFACTURING CO.

PHILADELPHIA DIVISION—PHILADELPHIA, PA., U. S. A. IN CANADA: ST. CATHARINES, ONT.

TRADE YALE MARK

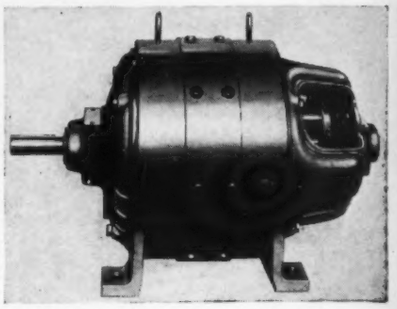
World's oldest and largest makers of Materials Handling Equipment, including Hand and Electric Hoists, Hand Lift Trucks, Electric Industrial Trucks and Tractors, Skid Platforms, and allied products.

executives or customers, silencing of substations when not in use. In most installations any voice will carry over 50 feet. Workmen may answer without leaving the assembly line or bench.

Has 2¼ watts power output, enabling ten substations to carry 5 simultaneous 2-way conversations with absolute privacy. Up to 2,000 feet of cable may be used between each station. For 110-115 volt a.c.-d.c. operation. Allied Radio Corp., 833 West Jackson Blvd., Chicago.

Regulator-Exciter

Regulex exciter combination unit provides quick-response regulation for automatically holding constant output on d.c. machines. Permits maximum-speed one-step acceleration or deceleration of large d.c. motors holding constant the rolling speeds between the acceleration and deceleration periods. Has characteristics such that the shunt field resistance line, saturation curve, and airgap line are made to coincide, for all practical purposes, in one straight line. A control field provides regulation as required in the control functions for which it is used. With minimum inductance in control field, voltage changes are lightning-like in their movement. Because of low resistance the control field provides unusual accuracy. Allis-Chalmers, Milwaukee, Wis.



Trimmer

Known as Ideal-Cut, trimmer is designed to trim or cut to size blueprints, drawings, tracing cloth, cardboard, skins, leather, or cloth. Margins from ⅛ to 2 inches set automatically. Several thicknesses can be cut at one time. Simple, speedy, precise operation plus minimum maintenance cost (old razor blades are used for the cutting edge) are among the features claimed. Available in four sizes, from 32 inch over-all with 25 inch cutting size, to 62 inch over-all with 55 inch cutting size. Edi Trimming Machines, 611 W. 112th St., New York.

EASY OPERATION
Engineered into DUFF-NORTON Jacks
REDUCES YOUR SHOP COSTS

A FEW OF THE 300 TYPES AND SIZES OF DUFF-NORTON JACKS

The ideal jack for general service. Sturdy, efficient. Sizes 5 to 20 tons.

This "Jack of All Trades" combines straight lifting with chain, hook and foot lifting.

Handy Ball Bearing Jack Screws are made in 38 sizes, 5 to 30 tons capacity.

For pushing or pulling with or without chains or cables.

You can cut costs, speed jacking operations, reduce back-breaking physical labor by using sturdy, easy-operating DUFF-NORTON JACKS for lifting, lowering, pushing, pulling heavy loads.

Easy operation has been *engineered* into the design of every Duff-Norton Jack, from the largest to the smallest. For example, the ball bearing jack screw shown above carries its load on a full complement of chrome-molybdenum steel balls operating in a machine cut, grease packed, hardened steel raceway.

Whether you need 5-ton Jack Screws or 100-ton Power Jacks, it will pay you many times over to standardize on the line that has stood the test of time—DUFF-NORTON.

GET THIS FREE DATA BOOK!
A brand new illustrated data book on Jacks. Send for your free copy of this useful book TODAY. You should have it for your files!

THE DUFF-NORTON MANUFACTURING COMPANY
PITTSBURGH, PA.
Canadian Plant: Coaticook, Quebec
"The House that Jacks Built"

SKILDRILL

1/4 IN. CAPACITY – MODEL 45

NEW!

The Mightiest Mite of the Drill Field!

ONLY 6¾" OVERALL!

100% ANTI-FRICTION BEARING CONSTRUCTION

★ *Sells for only*

$32.50

IT packs a world of drilling speed and power in the palm of your hand—the new SKILDRILL is so small, so light, so compact, it gets into the tightest places . . . yet it's a bear-cat for work, wherever ¼-inch drilling is needed.

Take a SKILDRILL in your hand, look at its features, watch its performance and you'll want to have it handy in your plant—for precision production drilling, for installation or assembly work. Compact die-cast body, helical cut gears and 100% anti-friction bearing construction mean easy handling and smooth performance. Powerful Universal motor means fast drilling up to ¼ in. in steel, ½ in. in wood. SKILDRILL is a drill you should have . . . it's a drill you will want, once you see it in action. ALSO 21 OTHER POWERFUL MODELS.

SKILSAW, INC., 5043 Elston Avenue, Chicago

New York • Boston • Buffalo • Philadelphia • Cleveland • Detroit • Kansas City
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SKILSAW PORTABLE ELECTRIC TOOLS

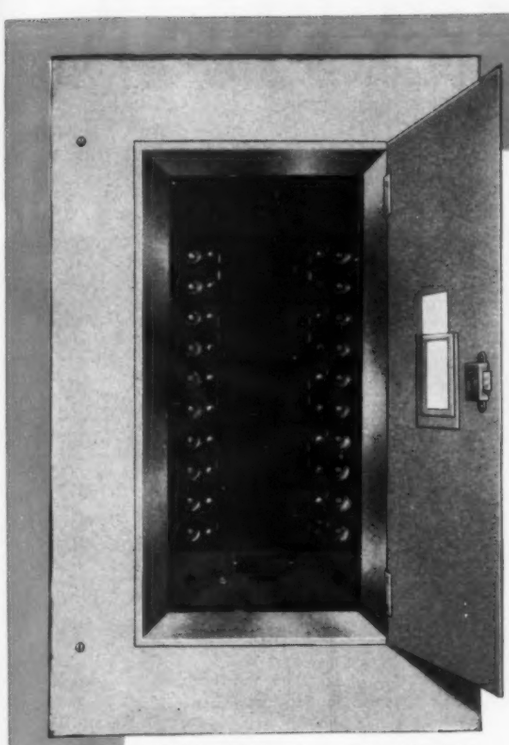
YOUR DISTRIBUTOR WILL GLADLY DEMONSTRATE THESE TOOLS ON YOUR WORK

JACK 'EM UP AND SET 'EM DOWN ON FELTERS UNISORB

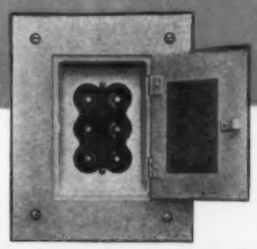
Relocate your machinery safely, speedily and at low cost, the Felters Unisorb way. By setting machines on Unisorb Cushion Machine Mountings, you eliminate the necessity of expensive, time-consuming floor preparations and the need for bolting machines down. Also, the Unisorb dampens and isolates vibration.

Many cases where machines have been relocated on Unisorb are described and illustrated in our free booklet, "UNISORB IN THE INDUSTRIAL PLANT." This booklet contains some constructive suggestions for you. Have your secretary get off a note for *your* copy of the booklet today.

The Felters Company
INCORPORATED
210-A SOUTH STREET • BOSTON, MASS.
Offices: New York, Philadelphia, Chicago, Detroit
Sales Representatives: Dallas, Los Angeles, Nashville, St. Louis, St. Paul
Mills: Johnson City, N. Y., Millbury, Mass., Jackson, Mich.



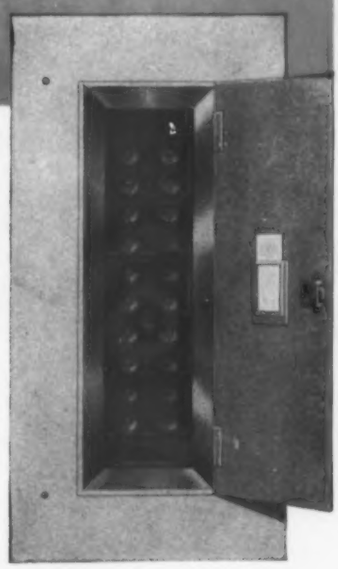
Installation in plant of The Blanton Company, makers of "Creamo" Margarin, St. Louis . . . Dennison-Loepker Electric Company, St. Louis, Electrical Contractors.



Type FBX-Enclosed Cutout. Capacity: 2 to 24 circuits. Use: Residential and small commercial installations where no switch control is required.

Type LNT1P-Panelboard. Capacity: 4 to 42 circuits. Use: Any installation where switch control of circuits at panel is preferred.

Type NR3G-Panelboard. Capacity: 4 to 32 circuits. Use: Any installation where only local control of outlets is required, and larger size gutters are needed.



There are Many Places

where one or more of the complete range of

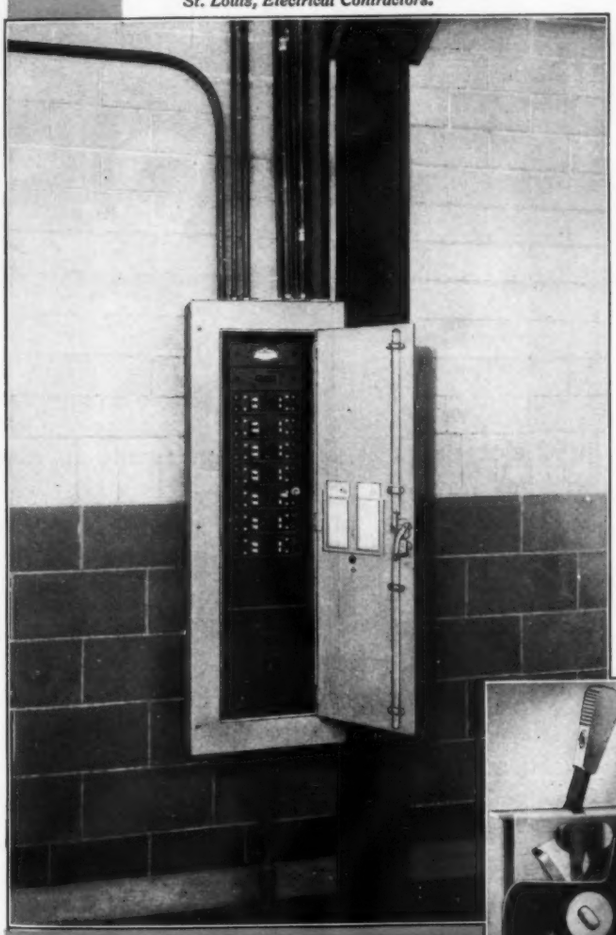
Fuse Type Branch Circuit

FA PANELBOARDS

for LIGHTING and APPLIANCE

use, will fill the bill exactly—meeting the approval of the architect, the contractor and the owner. Safety, modern protection and attractive appearance are embodied in each panelboard.

FA Panelboards are dead front safety type, built of *standardized* molded sections, installed in *standardized* cabinets. This standardization expedites production, improves the product and lowers the cost. They are available with either fuse only, or switch and fuse branch circuits. Because of the improved type of non-tamperable fuses, with greater time-lag characteristics, which hold on momentary overload, but blow on short circuit or sustained overload, maximum protection—at moderate cost—is obtained. These safety-type panelboards, with cabinets, for flush or surface mounting, may be had with from 4 to 42 circuits. Boxes have ample knockouts in top and bottom, and ample gutter space for wiring. Adjustable supports permit an outward adjustment of ¾" for plumbing the panel, if the box is installed out of alignment. Fronts are attractively finished in pearl gray lacquer.



The simple design, yet rugged construction, 30 amp. FA Tumbler Switch used in LNT1P Panelboard.

Prompt Delivery: *There is a wholesaler near you who will make prompt delivery from stock . . . Write today for his name and address and for complete catalog information . . . . Frank Adam Electric Company, St. Louis, Missouri.*

EST. 1891 — THE SIGN OF A BETTER JOB

Frank Adam

1891 FIFTY YEARS SERVICE 1941

FRANK ADAM ELECTRIC CO. ST. LOUIS, MO. U.S.A.

BEST ANSWER

TO MOTOR INSULATION PROBLEMS

IN 1933

AND TODAY

Motor users approved Tuffernell Insulation then ...and like it better NOW

"Are windings adequately protected mechanically as well as electrically?" was a question we invited motor buyers to ask in 1933.

It's still a good question—and in Westinghouse CS Motors Tuffernell insulation gives the right answer.

For mechanical protection, each individual end turn is strongly taped. Combination slot cells of treated cloth cemented to fish paper hold slot portions of windings firmly in place without flexing.

For electrical protection, accurately controlled impregnation treatments penetrate every part of the winding. Coils are protected against damage from moisture, oil, grit, mild chemicals, and metallic dust.

What motor users think of dual-protected insulation is shown by the rapidly growing number of CS Motors which have gone into service in the years since we first announced it. Today it is more widely accepted than ever before.

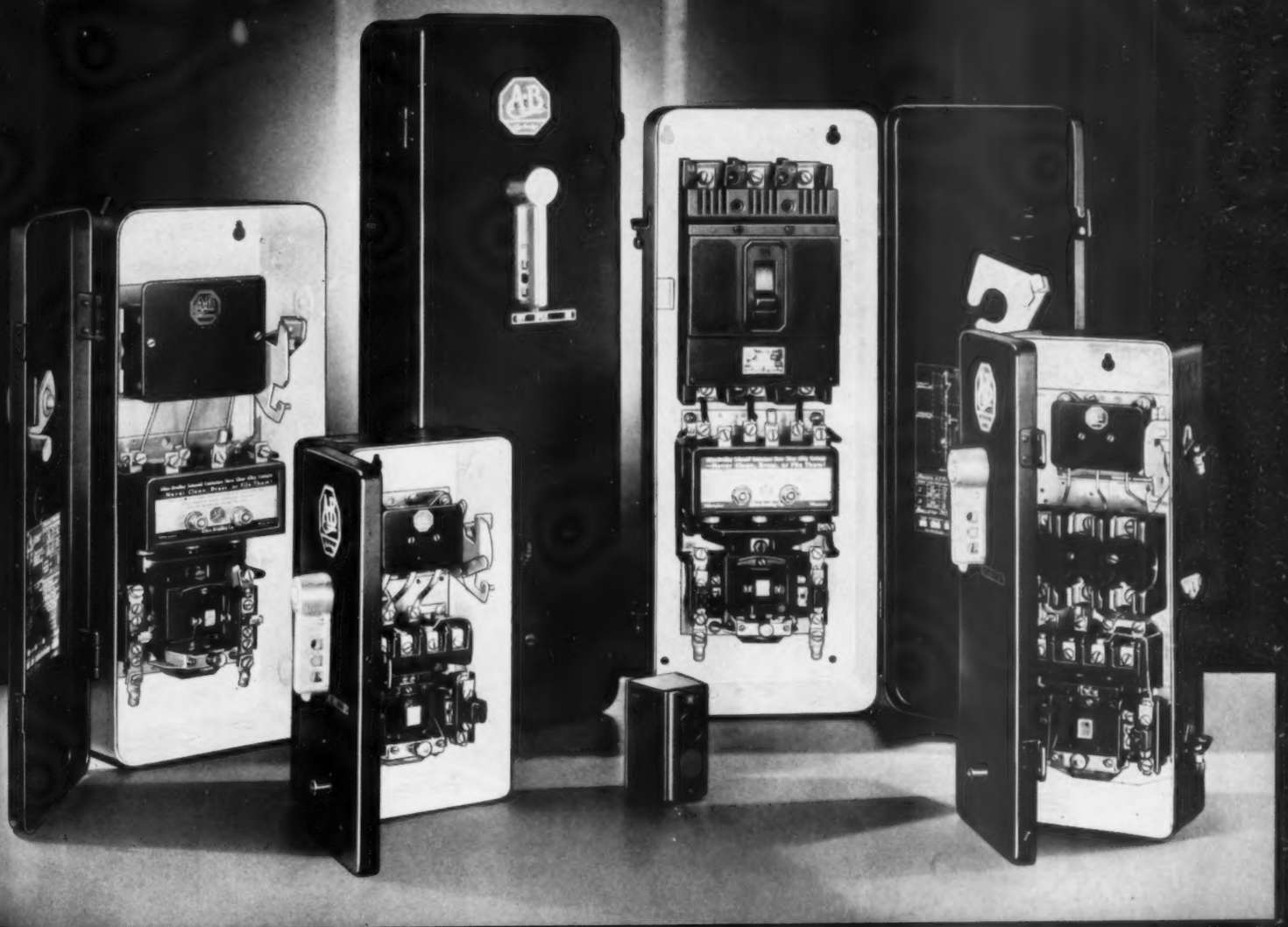
WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, EAST PITTSBURGH, PA.

Westinghouse

Use Combination Starters

(Across-the-Line Starting Switch + Disconnect Unit)

for Economy, Convenience, and Safety



Available in 5 Popular Sizes—Enclosures for Every Type of Service

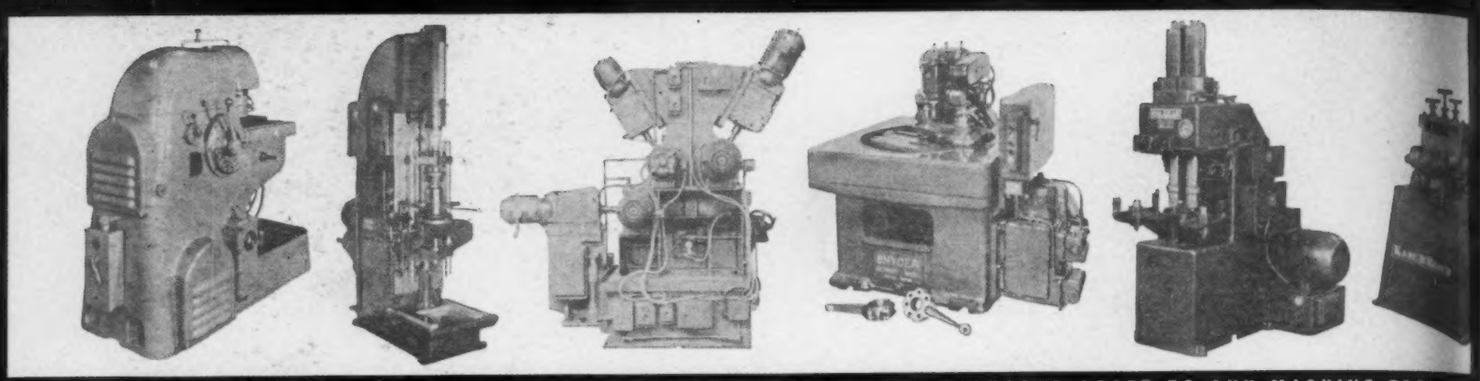
ALLEN-BRADLEY

BULLETIN 712-713 COMBINATION STARTERS

QUALITY

The Machine Tool Industry

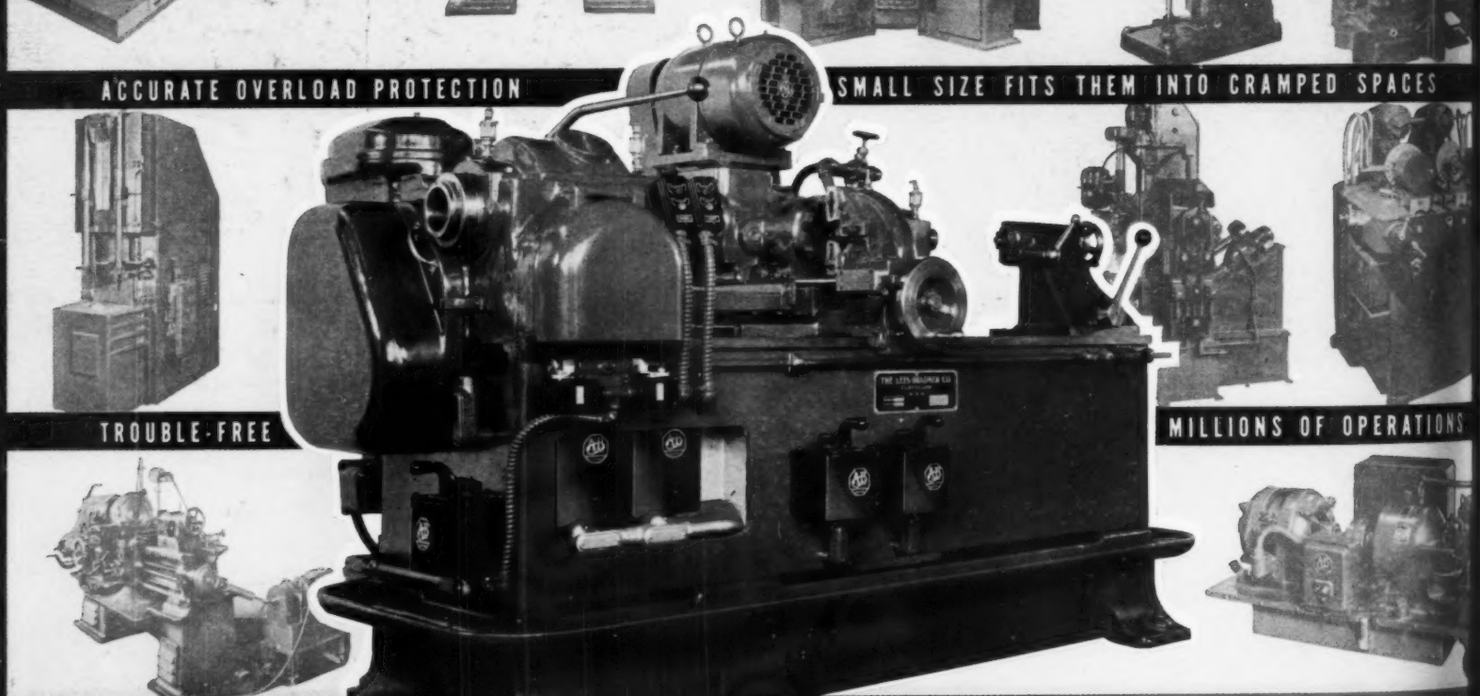
has gone over in a big way to Allen-Bradley Controls



THE ATTRACTIVE APPEARANCE OF ALLEN-BRADLEY CONTROLS IS A VALUABLE ASSET TO ANY MACHINE TOOL

ACCURATE OVERLOAD PROTECTION

SMALL SIZE FITS THEM INTO CRAMPED SPACES



TROUBLE-FREE

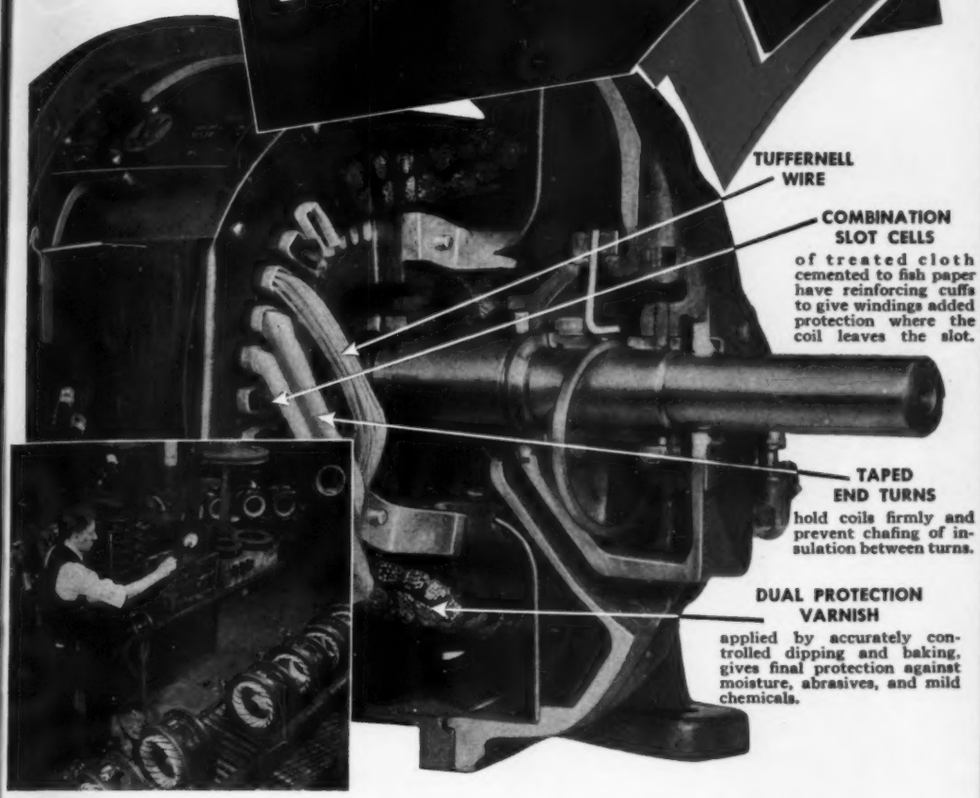
MILLIONS OF OPERATIONS

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

Allen-Bradley Company, QUALITY 1321 S. First St., Milwaukee, Wis.

TUFFERNELL INSULATION


TUFFERNELL WIRE
COMBINATION SLOT CELLS
of treated cloth cemented to fish paper have reinforcing cuffs to give windings added protection where the coil leaves the slot.
TAPED END TURNS
hold coils firmly and prevent chafing of insulation between turns.
DUAL PROTECTION VARNISH
applied by accurately controlled dipping and baking, gives final protection against moisture, abrasives, and mild chemicals.

From the first coating applied on the Tuffernell wire to the final dipping and baking processes for protection against moisture, abrasives, and mild chemicals, Westinghouse Tuffernell insulation meets every requirement of complete dual protection against mechanical and electrical hazards.

The Westinghouse high-frequency test is the final step which reveals minute flaws in insulation between turns which might cause failure in service, but which ordinary coil tests do not detect.

RENEWAL PARTS AND SERVICE

Not only for current models, but for any Westinghouse Motor or control device ever built, Westinghouse assumes the responsibility of providing renewal parts. They are made with the same tools as the original equipment and to the same rigid standards. Parts are therefore interchangeable and maintain the original performance.

The 34 district manufacturing and repair plants are so located throughout the United States that parts or service are available overnight wherever your plant may be.

J-21176

ONE-PIECE FRAME

The integrally cast frame of the Westinghouse CS Motor, developed and introduced by Westinghouse, protects the electrical elements fully against twisting strain and vibration.

SEALED-SLEEVE BEARING WITH FELT GASKET AND VESTIBULE SEAL

Oil is sealed in—dirt and dust are sealed out. Only in Westinghouse CS Motors do you get this dual protection.

Type CS Motor with sealed-sleeve bearings, one-piece frame, and Tuffernell insulation.

Type CS Motors

There is something missing from this picture. Ten pairs of flanges were eliminated by using prefabricated ARMCO Spiral Welded Pipe.

A dollar saved is a dollar earned . . . One mill recently eliminated ten pairs of flanges and saved $68.00 on just two small fittings by using prefabricated ARMCO Spiral Welded Pipe. This was only part of the installation. Costs were lower all along the line.

Every foot of ARMCO Pipe was custom-built to fit the job. Tees, wyes and elbows were made to measure and welded to straight pipe runs. This saved at least one pair of flanges at every bend and greatly simplified assembly.

ARMCO Pipe also gives years of high operating efficiency. Fewer flanges mean fewer joints, less chance for leaks. And "Spiral Welded" has no threads to weaken the metal and invite corrosion.

You can make similar worthwhile savings by using ARMCO Spiral Welded Pipe on that next job. Diameters range from 6 to 36 inches, wall thicknesses from 7/64 to 1/2-inch. Send us your plans; we'll gladly submit a quotation. The American Rolling Mill Company, Pipe Sales Division, 1431 Curtis St., Middletown, O.

ARMCO

ARMCO SPIRAL WELDED PIPE

How Industry Is Regulated in Wartime Britain

(*Continued from page 77*)

dustries have been required to make their own arrangements (within a period specified by the Board of Trade) to concentrate their reduced output in a smaller number of "nucleus" firms which will work at full capacity. The nucleus firms will act as the agents of the firms who temporarily go out of production. The field covered by the measures for the concentration of industry will ultimately be the same as the field covered by the Limitation of Supplies Orders. On August 5 it was stated that 132 textile factories had been closed. In industries subject to Limitation of Supplies Orders, 534 factories are being released by measures for the concentration of industry. The last public figures stated that 16,500,000 square feet of factory space had been cleared for government production if desired, and nearly 110,000 workers had already been released or shortly would be released. The *Economist* of March 15, 1941, estimated that "within the next few months" between 500,000 and 750,000 men and women could be released by measures for the concentration of industry.

4. Employment Control

An act dated Sept. 2, 1939, known as the Control of Employment Act, empowered the Ministry of Labor and National Service to make an Order in any industry prohibiting employers from engaging men except through the Ministry of Labor and National Service, and employees from seeking or accepting such employment except through the local offices of the Ministry of Labor and National Service. This measure was an enabling measure, and no action of any importance was taken under it until May, 1940, when certain employers and trade associations alike requested that the act should be implemented to prevent competitive bidding by employers for workers in engineering and other skilled trades, for example: Machine Tool Trades Association; Oldham Master Spinners Association.

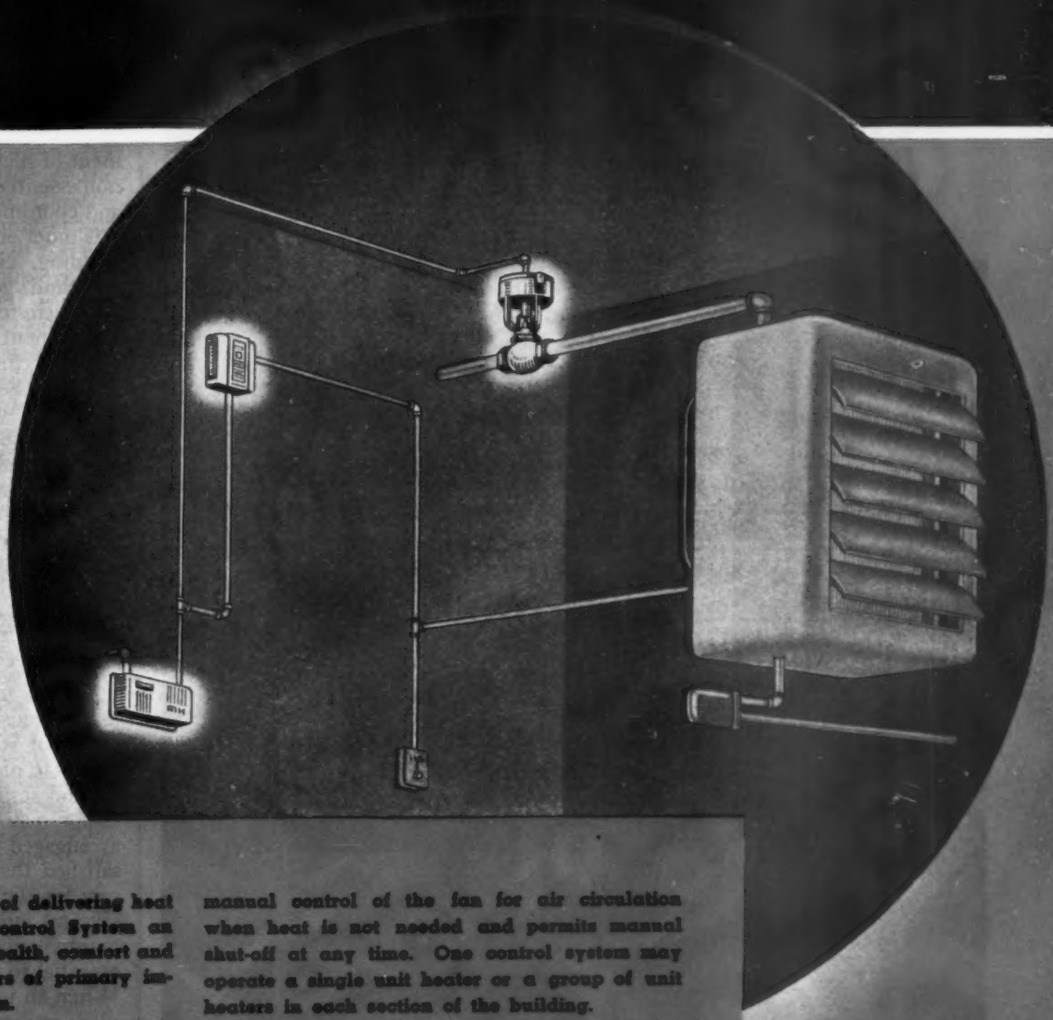
5. Emergency Powers

The Emergency Powers Act (58A, 1940) gave the Minister of Labor the right "to direct any person in the United Kingdom to perform such services in the United Kingdom as may be specified by the direction, being

CONTINUOUS FLOW

Control Systems FOR UNIT HEATERS

BY **MINNEAPOLIS-HONEYWELL**



THE UNIT HEATER method of delivering heat makes the Continuous Flow Control System an absolute necessity, now that health, comfort and efficiency are recognized factors of primary importance in industrial production.

The Minneapolis-Honeywell Continuous Flow System eliminates stratification of air, hot blasts of air and accompanying erratic space temperatures. This system, operated either pneumatically or electrically, provides a continuous flow of steam, varying with the demands of the thermostat. It also provides continuous automatic fan operation and automatic shut-off when steam is not being supplied. An "off-on-automatic" switch allows manual control of the fan for air circulation when heat is not needed and permits manual shut-off at any time. One control system may operate a single unit heater or a group of unit heaters in each section of the building.

Make sure your clients will be satisfied with your unit heater installations. Recommend and install a Minneapolis-Honeywell Continuous Flow Unit Heater Control System with every job. Minneapolis-Honeywell Regulator Co., 2706 Fourth Ave. South, Minneapolis, Minnesota. Canadian Plant: Toronto. European Plant: London. Company owned branches in forty-nine other cities.

MINNEAPOLIS-HONEYWELL

UNIT HEATER *Control* SYSTEMS

PNEUMATIC CONTINUOUS FLOW SYSTEM
ELECTRIC CONTINUOUS FLOW SYSTEM
ELECTRIC "ON-OFF" SYSTEM

INLAND
4 WAY
FLOOR PLATE
ASSURES—
Safe traction for feet and wheels in all four directions.
Structural strength and stiffness of rolled steel plate.
Lowest maintenance cost during years of hard usage.
Washing and rapid drainage in whatever direction most convenient.
INLAND STEEL CO.
38 S. Dearborn St., Chicago
Sales Offices: Milwaukee, Detroit, St. Paul, St. Louis, Kansas City, Cincinnati, New York

services which that person is, in the opinion of the Minister, capable of performing." The wages and the conditions of service are fixed by the Minister but he is to pay due regard to the rates usually paid, and in particular to agreed rates and conditions laid down by the employers and trade unions in any particular industry.

6. Undertakings

Dated June, 1940, the Undertakings (Restriction on Engagement) Order was designed primarily to use skilled labor in the building and engineering trades to the best advantage by preventing any possibility of enticement of such workers from essential to non-essential work, and by centralizing and coordinating their placing. Under this order employers and employees in building, civil engineering, contracting, and general engineering industries were forbidden to offer or to seek engagement except through the local office of the Ministry of Labor and National Service. The provisions of the order were extended to agriculture and coal mining, and in March, 1941, to shipbuilding. Under this regulation men might not change their *occupation* though they might move, for example, from farm to farm or from mine to mine.

7. Essential Work

Effect of the Essential Work Order (1941) is to control movements within an industry from employer to employer of labor employed on *essential* work. It places restrictions on dismissal and resignation. The Minister of Labor may schedule any undertaking as engaged in essential work if he is satisfied that such a measure is necessary for the defense of the realm, the efficient prosecution of the war, the maintenance of supplies or of services essential to the life of the community. When an undertaking has been scheduled under this order, management may discharge men and employees may leave their work only subject to the permission of an officer of the Ministry of Labor and National Service, and after at least one week's notice. This National Service officer is also ultimately responsible for proper discipline within the factories after report from the employer in cases of absenteeism and late arrival, etc. There is provision for appeal to a local appeal board. A minimum rate of wages is guaranteed, and provision is made in such industries for welfare both inside and outside the factory, including housing, traveling, and feeding. The industries that have so far come under the provisions of Essential Work Order are shipbuilding and repairing,

the building trades, engineering, and coal, iron, and steel.

On July 18, 10,409 undertakings were scheduled for Essential Work.

On August 9, 1941 a colliery worker summoned at Doncaster was sentenced to a fine of £5 or 3 months' imprisonment for refusal to comply with the direction given by the Ministry of Labor to perform employment as a mine worker. The defendant refused to work in one particular pit. He accepted the sentence of 3 months and refused to pay the fine.

8. Registration

The Registration for Employment Order (dated March 15, 1941) enabled a survey to be made of the available labor force in the country, with a view to selecting those people who are likely to be useful to the war effort whether they are in employment or not. After registration, workers may be required to attend a selection interview and change their employment. The First Industrial Registration Order applied to men over 20 years, and capable of work, who had been engaged in shipbuilding or ship repairing for not less than 12 months any time within the last 15 years.

9. Trade Disputes

At the outbreak of the war it was agreed between the Ministry of Labor, organized employers, and trade unions that the normal machinery of industry should continue to function without the imposition of any special form of statutory regulation. A National Joint Advisory Council representing the British Employers Confederation and the Trades Union Congress was established to advise the government on matters in which employers and workers had a common interest. After 8 months of war, however, it became necessary for the state to take much greater powers of control, including such control over persons as would enable it, where necessary, to direct the services to be performed by individual work people. The advice and assistance of the National Joint Advisory Council was invited in order to find the best means of keeping industrial relations out of the field of controversy and of settling trade disputes without interruption of work. The Council appointed a Consultative Committee which unanimously agreed on the imperative need to prevent a stoppage of work from trade disputes. The Consultative Committee recommended, among other points, that no strike or lockout should take place until a dispute had been reported to the Ministry of Labor and National Service, and had not been disposed

FOR *more efficient* HANDS ...AND Greater Man-Hour Productivity!

Management in industry provides working facilities and soap for practical ends—employee good will. Attention also SHOULD be centered on your washroom's influence on the work-efficiency of the men's hands as they come on shift. Harsh chemical cleaning that parches the skin tends to increase the finger-stiffness and lack of dexterity which holds back production for the first hour.

LANOKLEEN*

A NEW corn-meal soap impregnated with lanolin applies the corrective. It not only cleans with the same efficiency you attribute to sand-grit soaps but SOFTENS THE SKIN to a normal healthy condition. THINK IT OVER! It is worth while thus to improve the condition of working hands—provided your soap cost is no more than at present? We believe you'll say YES. There's one quick way to start finding out. That is to clip the coupon to your business letterhead and EXPERIMENT FOR YOURSELF. You'll find it worth while.

FOR THOSE WORKERS IN CONTACT WITH SKIN-IRRITANTS

West manufactures a complete range of

SKIN-PROTECTIVE CREAMS

after formulae especially created to meet certain conditions. Our home and branch office staffs will be glad to discuss your needs for a standard or custom-made product of this kind.

* Reg. U.S. Pat. Office

CLIP THE COUPON TO YOUR BUSINESS LETTERHEAD!

WEST DISINFECTING COMPANY

42-16 WEST STREET, LONG ISLAND CITY, N. Y.

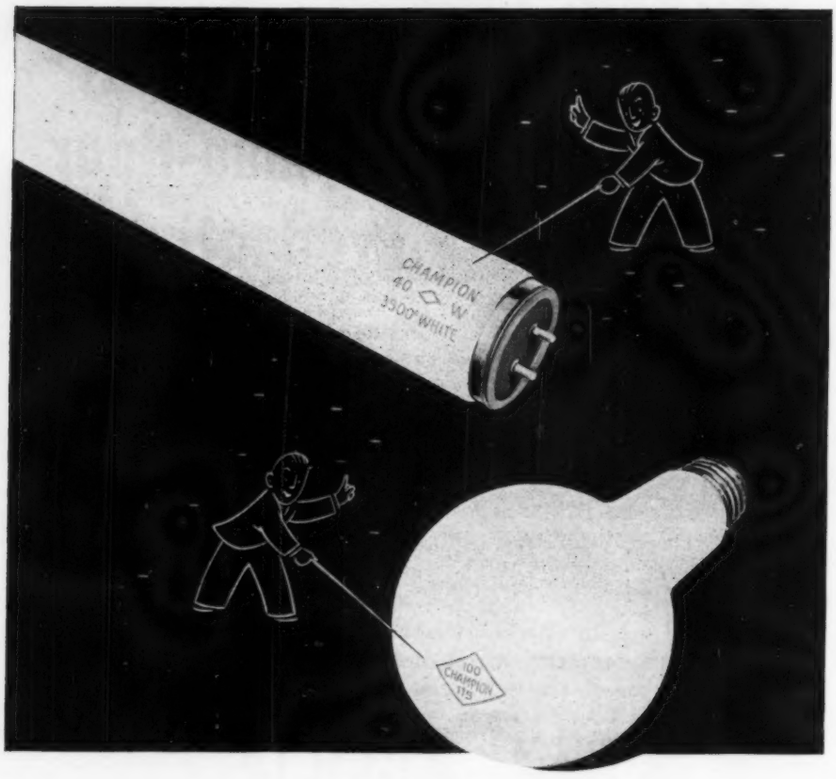
Attn: Dept. J: Please send me a copy of your LAN-O-KLEEN folder ( ) with ( ) without sample of product. ( ) We are also interested in West Protective Creams.

Name of Safety Engr.....

Name of Company.....

Street and City.....

When Your Lamps Wear "DIAMONDS"



. . . *You're Sure of* CHAMPION *Performance*

Look for the Champion *Diamond* mark on your Fluorescent and Incandescent Lamps. The diamond is an appropriate symbol of security when it comes to lamps. It identifies them as products of *controlled quality,* made since 1900 by an organization that has dedicated its entire skill, experience and resources to the proposition that there shall be no better lamp than Champions . . . Ask your regular supply house about them.

Champion Lamps are licensed under General Electric Co. incandescent and fluorescent lamp patents

CHAMPION LAMP WORKS
Lynn, Massachusetts
A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO.

of or referred by him for settlement to the machinery of negotiation or to arbitration within 21 days.

Matters in dispute which could not be settled by the normal machinery of negotiation should be referred to arbitration or decision which should be binding on all parties.

A National Arbitration Tribunal should be appointed to which any disputes should be referred where the ordinary machinery of negotiation did not provide for reference to arbitration.

Wages and conditions of employment settled by representation, machinery of negotiation, or by arbitration should be made binding on all employers and workers in the trade or industry concerned.

10. Employment

The Conditions of Employment and National Arbitration Order (1941) was subsequently made, giving statutory effect to these recommendations. Its main purpose is to prevent work from being interrupted during the war by trade disputes, but the fullest possible use is still made of trade joint machinery to settle not only wages and working conditions but also any differences and disputes that may arise. Reference of a dispute to the National Arbitration Tribunal is required only when the matter has not been settled by negotiation between the parties. The principle of self-government in industry and the Fair Wages principle are further supported by the requirement that all employers shall observe terms and conditions laid down in voluntary agreements, or by a decision of joint bodies representing in both cases substantial proportions of employers and workers.

11. Reserved Occupations

Put into operation April, 1941, the Schedule of Reserved Occupations introduces a new principle of *protected* work. In some occupations two ages will be fixed, the age of reservation for the named occupation, and a lower age for men in such occupations who are engaged on work protected "for its importance to the war effort." The Minister of Labor is compiling a Register of Protected Establishments. The purpose is to insure that every man of military age reserved from the fighting forces is not merely *available* for essential work but is in fact *doing* essential work. Such occupations include, for example, engine fitters, protected at 23 and reserved at 35 (from July, 1941). Certain establishments are also protected.

(a) Mining, metal manufacture,

HELPFUL HINTS ON CHOOSING VALVES FOR BETTER PIPING SERVICE
PLEASE CHECK AND PASS ON
POST ON SHOP BULLETIN BOARD
AN AID TO DEFENSE
No. 3 of a series of bulletins designed to help industrial maintenance men keep piping systems working at peak efficiency. Issued by Crane Co.; distributed by Crane Representatives.
Shop Bulletin No. 1 gives hints on handling valves and fittings; No. 2 shows pointers on piping placement. Ask your Crane Representative to explain how you can get valuable aid from this practical service.

Ready for you...

CRANE SHOP BULLETIN NO. 3

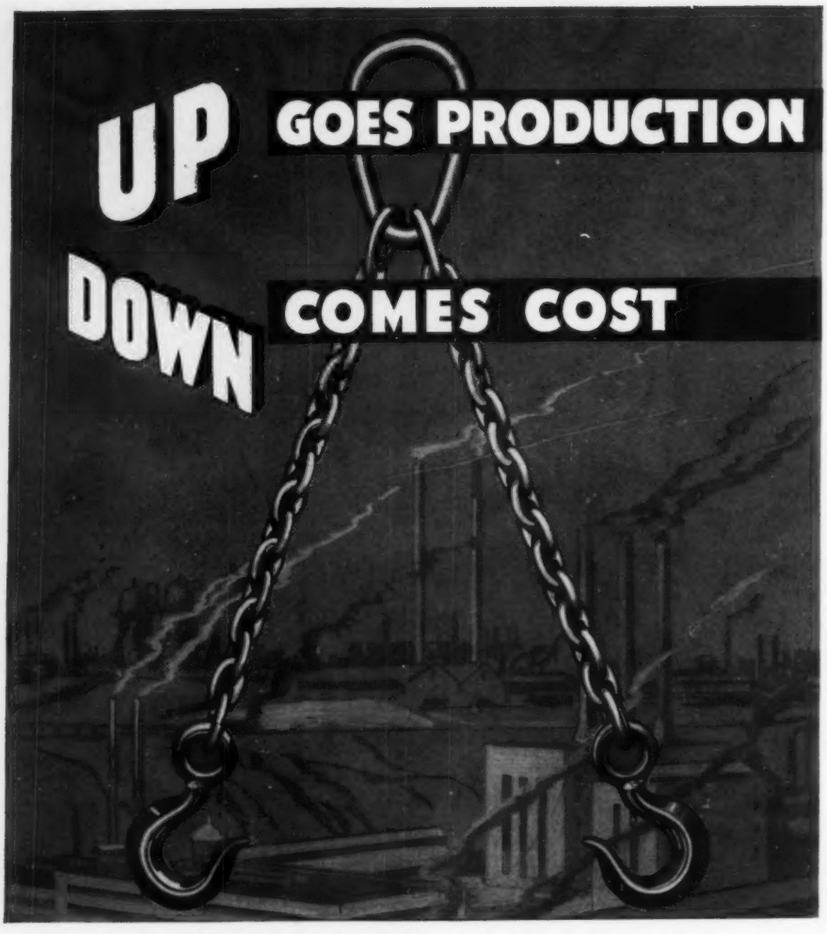
It's ready—to help you keep pipe lines in peak condition for peak production—to help you get maximum service from present equipment. This timely Crane Shop Bulletin Service is designed to aid you in training new maintenance men; and to caution experienced workers on piping fundamentals often overlooked with costly results. Bulletin No. 3 gives many valuable hints on the proper selection and usage of valves. Copies for distribution to your piping crews may be had from your Crane Representative—or by writing to us.

CRANE

CRANE CO., GENERAL OFFICES: 836 S. MICHIGAN AVE., CHICAGO

VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS

NATION-WIDE SERVICE THROUGH BRANCHES AND WHOLESALERS IN ALL MARKETS



HERC-ALLOY SLING CHAINS

double STRENGTH SERVICE SAFETY

Smooth movement of materials through manufacturing departments means more profits. Herc-Alloy Sling Chains, America's FIRST alloy sling chains, are facilitating speedy production, safeguarding men and materials, and reducing costs in every type of industry.

Fabricated from a high-grade alloy steel of nickel and molybdenum, Herc-Alloy Sling Chains have the endurance and stamina to withstand the toughest industrial assignments. Heat treating under rigid pyrometer control insures uniformity and ductility. Herc-Alloy Sling Chains never crystallize or develop grain growth ... therefore, they NEVER require annealing. Links are electric welded by the patented "Inswell" process providing 25% more metal at the critical point in the link ... at the weld. For double strength, service and safety, plus cost-cutting performance, specify Herc-Alloy Sling Chains.

CM manufactures a complete line of chain for every application. Trained engineers are available for consultation on your chain problems. Write for Herc-Alloy catalog today.

COLUMBUS-McKINNON Chain CORPORATION

(Affiliated with Chisholm-Moore Hoist Corporation)

130 FREMONT AVE. TONAWANDA, N. Y.

Branch Offices: NEW YORK • CHICAGO • CLEVELAND

shipbuilding and such essential war industries.

(b) Establishments wholly occupied on government work and/or on work for export.

(c) Road transport undertakings and establishments engaged mainly in the repair and upkeep of essential motor vehicles. In this case the Ministry of Transport will guarantee the essential nature of the work.

(d) Building and construction. In this case the Ministry of Works and Buildings will be consulted.

(e) Groups fulfilling conditions prescribed by the Board of Trade for concentration of production.

The *Economist* has stated that "The raising of the age of reservation under the Schedule of Reserved Occupations will set something like 1,000,000 men free between now and the autumn, either to fight or to enter the war industries."

14. Location of Industry

At the beginning of August the Location of Industry Order was made by the Board of Trade. It provides that no person may, without a license issued by the Board of Trade, carry on at any factory or warehouse, having an area of 3,000 or more feet super, any trade or business not carried on there previously. No person may without a license of the Board of Trade carry on at other premises, having an area of 3,000 or more feet super, whatever their previous use, a business of production or storage. The object of the Order is to facilitate provision through the control of factory and storage premises of factory and storage accommodation urgently required for government purposes.

Luxury Goods, Too, Must Be Closely Controlled

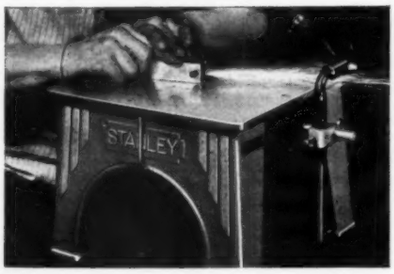
(Continued from page 76)

scription of products to be entered into production; requisition for supplies (data); filling and finishing order numbers.

These cards are prepared and maintained by the planning department. They are filed according to date shown in upper left-hand corner. This follow-up file indicates at all times the production to be run each day.

One day before the specified date of production, the planning department contacts the laboratory to make sure that material will be delivered on time. If, when this check-up is made,

Is "Waiting For Big Machines" Stifling Your Production?



STANLEY CONTOUR GRINDER – high speed grinder for finishing dies, gauges, templets, finding blanks; correcting hardening distortions. Scores of other light grinding jobs! Tilts to 45°.

STANLEY TOOL ROOM GRINDER – can be used freehand or in milling machine, shaper, lathe. Handles external or internal grinding on dies, machine parts, cutters, etc. Drives wheel up to 1½" x ½".

Check those jobs which are held up by slow delivery of big machines. Get your Stanley Distributor in! Invite him to show you how and where Stanley Electric Tools can speed up your production. To demonstrate how accurately and fast these tools can handle many time-consuming jobs.

He will show you Stanley Unishears for cutting sheet materials. Stanley Grinders – Contour, Toolroom, Bench and heavy Portable types. Stanley Electric Hammers, Drills, Screw Drivers and Safety Saws. Every one of these tools will help you cut corners without costly delays. If you prefer, write for literature. Stanley Electric Tool Division, The Stanley Works, 143 Elm Street, New Britain, Connecticut.

STANLEY
Electric Tools

STANLEY FLEXIBLE SHAFT GRINDER – has 42" shaft; handle with collet type ¼" chuck. Used for fast grinding – internal or external – on tools, dies, castings. Direct drive ⅜ H. P. motor. 18,000 R. P. M.

STANLEY "FLUD-LITE" EYE SHIELD – has two 4" x 6" safety glass windows; two frosted, shadowless bulbs. Adjustable guards. Gives 30% more visibility.

How to Increase Production for 1¢ a week per worker
Top speed production is the order of the day. Step up the efficiency of your workers' hands with Formula SBS-11 the safe, industrial skin cleanser, and you automatically step up each workers' productivity. Formula SBS-11 quickly, easily, and safely removes grease and grime; helps prevent dermatitis and skin infection.
FREE TRIAL: Test Formula SBS-11 in your plant at our expense. Write today for free trial supply to Sugar Beet Products Co., 303 Waller St., Saginaw, Michigan.
Formula SBS-11
THE WASHWORD OF INDUSTRY

it is discovered that there will be a delay, an appropriate notation is made on the follow-up ticket, and it is re-filed under the new promised date.

Requisitions for supplies are made by the planning department in duplicate. One copy is sent to the warehouse, and one is retained in the planning department (Figure 6).

Requisitions for all supplies needed each day are prepared two days in advance, and are given to the warehouse by 3 o'clock on the day before production is to be run, so that the supplies may be brought to the manufacturing floors in time.

When supplies are delivered, the warehouse sends the requisitions to the statistical department where they are coded. The stock record clerk then withdraws the appropriate code cards from the "assigned stock" file, thus recording the fact that stock which has been reserved for production has been delivered to the production department.

When stock is delivered to the finished stock department, a notation is made on the daily delivery report and initialed by a representative of the department receiving the stock.

Quantities shown on the delivery reports are checked daily against the completed production orders.

Posted Daily

Completed production, as indicated by these reports, is posted daily to Form B by the planning department.

Supply records are maintained on tabulating card forms which are filed in tubs by code numbers.

Quantities of these cards are punched in advance to show two things—the code number of the item and the quantity of items that any particular card may represent. These cards are, in effect, chips that are placed in one file to indicate the quantity on hand, and withdrawn from the file when the supplies are no longer available.

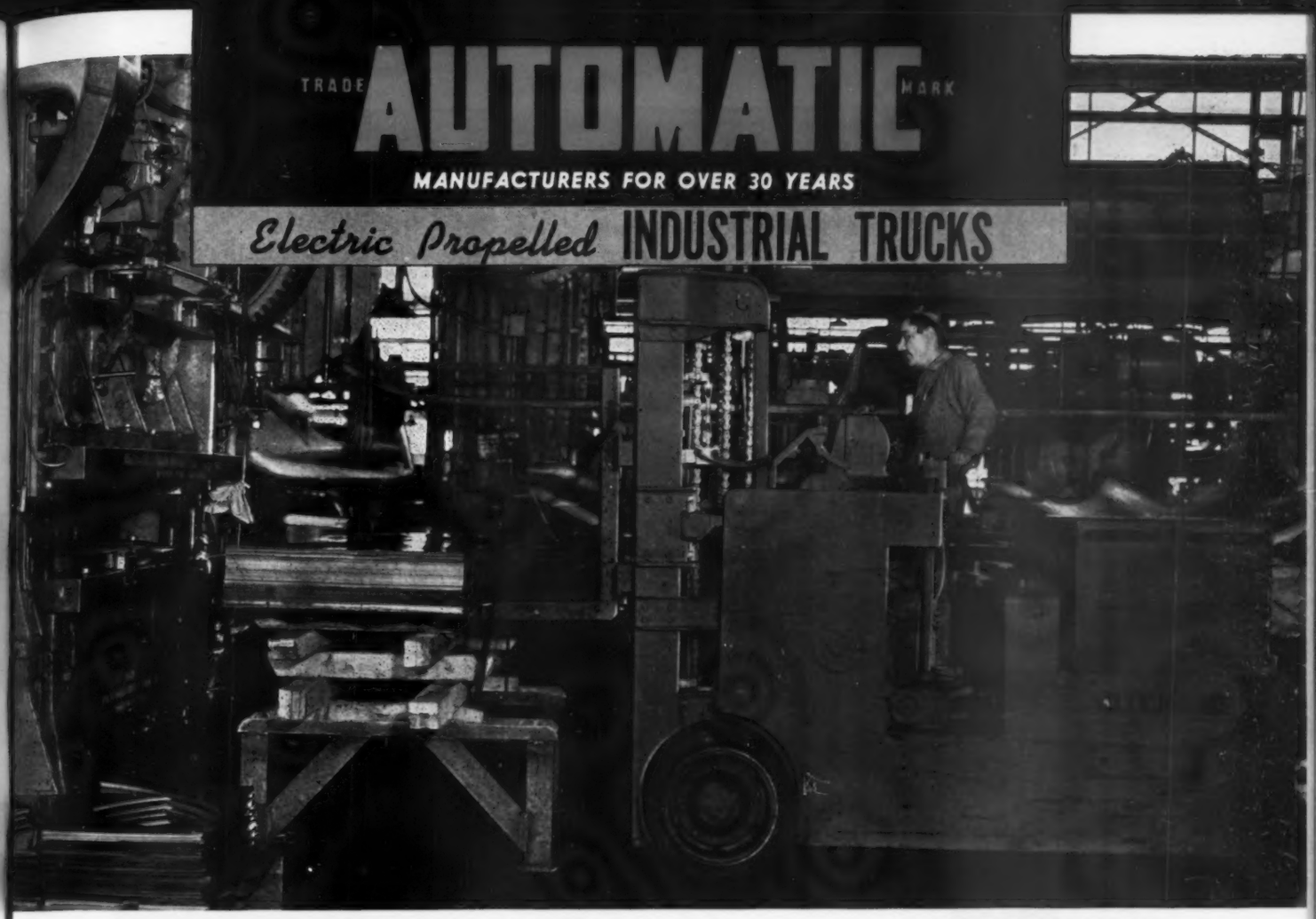
There are two sets of tubs. One set is for supplies on hand, the other for supplies that are on hand but which have been reserved for production. When supplies are received in the plant from the vendor, appropriate cards are piaced in the "on-hand" file. When a production stock order form is received from the planning department, cards are withdrawn from the "on-hand" file and placed in the reserved (or "assigned") file where they remain until a signed requisition is received from the warehouse indicating that the assigned stock has actually been used.

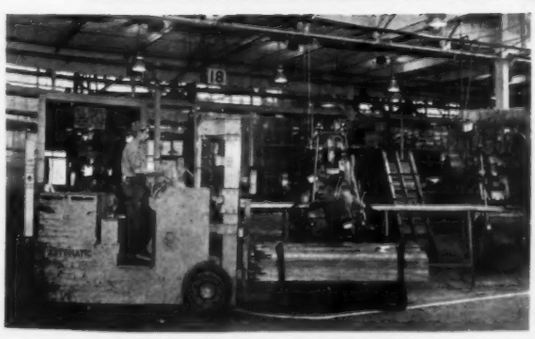
If, in the course of withdrawing cards from the "on-hand" file, the

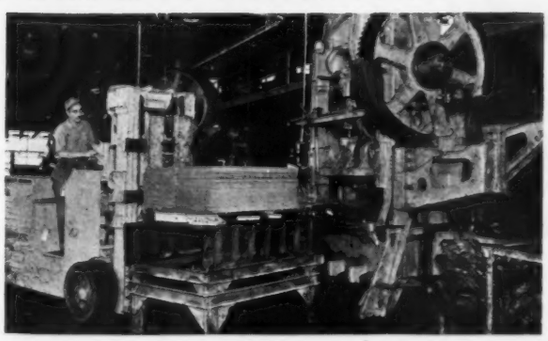
TRADE **AUTOMATIC** MARK

MANUFACTURERS FOR OVER 30 YEARS

Electric Propelled **INDUSTRIAL TRUCKS**







Heavy - duty "AUTOMATIC" Fork Trucks Service Production Machinery with Utmost Efficiency and Economy

The typical scene is in a large automotive plant where a large battery of die presses must be continually served on a 24-hour basis with metal blanks for making the variety of automotive body parts. Incoming bundles of steel plate weighing 10,000 lbs. each are transported to storage by "AUTOMATIC" Heavy-duty Telescopic Lift Fork Trucks. As the material is required at the die presses, the trucks remove same from storage and transport the individual bundles as shown to the various machines. Note how loads are deposited at the machines at heights convenient to operator.

This flexible method of handling metal material keeps the production machinery operating at highest peak, eliminates bottle necks, and provides a highly efficient stacking system resulting in controlled handling at lowest cost per unit. Write for full information without obligation.

AUTOMATIC TRANSPORTATION CO.

DIV. OF THE YALE & TOWNE MFG CO

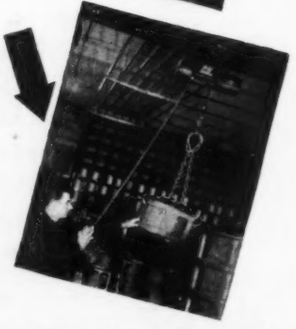
39 W. 87th STREET **CHICAGO, ILLINOIS**

WHEN YOU BUY TRUCKS - - *Buy* "AUTOMATIC"

Try This in Your Shipping Room

What a difference it makes when the loading or unloading of trucks becomes an almost automatic operation—without effort—without strain—without waste of time. Here, one man does it all, simply by pressing buttons.

...Machine Shop Heavy parts go to and from machines, smoothly and accurately — without operator fatigue. "Spot Handling" like this lets men and machines produce more.



Or Storage Rooms These are just a few of the many places where the Zip-Lift saves money with fast "through the air" handling of materials. It costs surprisingly little, too! For the Zip-Lift is the only real wire rope hoist in the low price field with full magnetic push-button control. Just hang it up by hook, bolt, or trolley and plug into any standard electrical circuit.

An interesting bulletin called "Handle It Through the Air" shows many other ways a Zip-Lift saves and earns money. Write for Bulletin H-20.

General Offices: 4525 West National Avenue, Milwaukee, Wisconsin

HARNISCHFEGER
CORPORATION
HOISTS • WELDING ELECTRODES • MOTORS P&H EXCAVATORS • ELECTRIC CRANES • ARC WELDERS

stock record clerk meets a "minimum" warning card, she notifies the purchasing department that stock is in need of replenishment.

For each half-month period, a summary report is made of the total bottles, jars, and boxes to be filled. These figures are divided by the number of working days in the period to determine what should be the average daily production.

These data, in turn, are compared with the known capacity of the filling and labeling machines to determine whether production can be handled without recourse to special means.

In a similar manner, the labor requirements are estimated to determine where there may be a deficiency or excess of personnel. An "operation data" file in the planning department (Figure 7), together with past records of production and payroll, provides a basis for this estimate.

The system herein described, although simple in every detail and inexpensive to operate, has been invaluable in helping to maintain the high rate of inventory turnover that is necessary for profitable operation in this industry, and in helping to eliminate "back orders" and "shorts." There are 2,000 items in the line; each item requires a number of different ingredients, containers, bottles, and packaging accessories; flow of product must be coordinated with a merchandising calendar and it is evident that there is indeed need for close control.

We Got Our Plant Ready to Carry a Load for Defense

(*Continued from page 57*)

departments for these products, each in effect a pilot plant, have been located in a building formerly used for storing pulley parts and castings, these parts having now been moved to the gallery of the pulley assembly department. Thus space has been reclaimed from non-productive uses and utilized for the manufacture of new products. Most of the room is used for steel window assembly. One end is blocked off and isolated for speed-reducer assembly, this work requiring little space but unusual cleanliness. Monorails serve both departments.

7. Machine Shops

We formerly operated two machine shops. The one that made small dies and used to be located in the pressroom—as previously described—

THE U.S. OFFICE OF EDUCATION
ANNOUNCES

MOTION PICTURES that help to teach MACHINE SHOP WORK!

THESE 18 FILMS IMMEDIATELY AVAILABLE:

5 ON THE ENGINE LATHE

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2. Turning Work of 2 Diameters
3. Cutting a Taper With the Compound Rest and With the Taper Attachment
4. Drilling, Boring and Reaming Work Held in Chuck
5. Cutting an External National Fine Thread

5 ON THE MILLING MACHINE

A. The Milling Machine
1. Cutting Keyways
2. Straddle and Surface Milling to Close Tolerances
3. Straddle Milling
4. Plain Indexing and Cutting a Spur Gear

3 ON THE VERTICAL BORING MILL

1. Rough Facing, Turning and Drilling on a Vertical Turret Lathe
2. Rough Facing and Boring and Turning a Shoulder on a Vertical Turret Lathe
3. Facing, Turning, Boring, Grooving, Chamfering on a Vertical Turret Lathe Using 2 Heads

5 ON PRECISION MEASURING

1. The Steel Scale
2. The Micrometer
3. Fixed Gages
4. Vernier Scale
5. Height Gages and Standard Indicators

THESE 32 TITLES WILL BE RELEASED SOON:

3 On the Shaper
2 On the Radial Drill
5 On Bench Work
5 On Bench Work and Centering
2 On the Lathe
1 On the Sensitive Drill
2 On the Vertical Drill
10 On SHIPBUILDING
2 On Action of Single-Point Cutting Tools

Fifty 16mm Sound on Film Subjects

The Whole Country has hoped for some method by which the training of defense workers might be hastened. Workers themselves have been anxious to acquire specialized skills. Now here is a powerful aid—in motion pictures that help to teach machine shop work!

Produced for U. S. Government—These films were made under the direction of the U. S. Office of Education, Federal Security Agency. These important teaching tools were primarily designed to aid and expand the nation's defense effort.

Accurate . . . Authentic—The pictures are accurate . . . authentic. They conform to the best methods in machine shop practice. They were supervised by old line experts. Leading American industries cooperated in their making. Those who have seen them call them one of the greatest contributions ever made to American industry and American workers.

Low Cost—These instructional films are being sold at the lowest possible cost to give them the widest possible use. Your cost is less than $9.00 per reel! All subjects are available in 16mm Sound On Film. Eighteen titles are now ready. Every training school, every factory, every plant maintaining machine shop activities needs these great teaching aids!

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GREATER STRENGTH--DURABILITY
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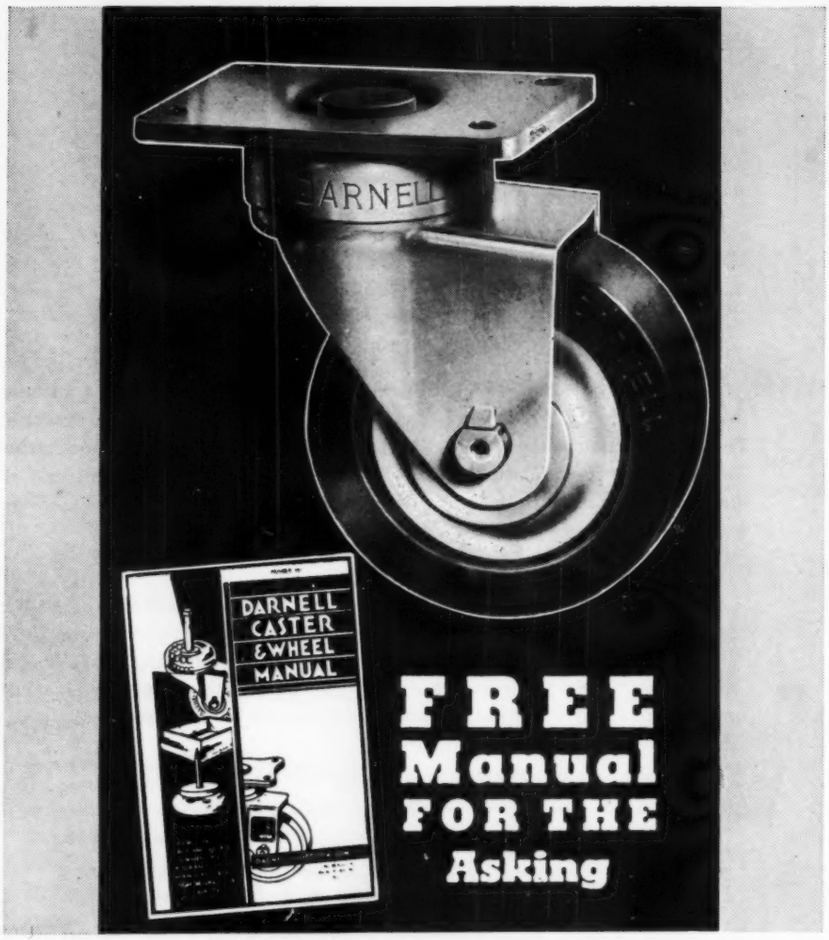
& E-Z ROLL WHEELS



DARNELL Corporation, Ltd.
LONG BEACH, CALIFORNIA
36 N. CLINTON ST., CHICAGO, ILL.
60 WALKER ST., NEW YORK N. Y.

has been moved out and consolidated with a machine shop for making and repairing dies and other miscellaneous machining operations. Results include better utilization of machine tools and less supervision.

The automatic screw machines, also from the pressroom, have been moved to a building adjacent to the consolidated machine shop, and the presses from that building have gone to the pressroom where they belong. A new crane handles bar stock from delivery trucks to racks, from racks to screw machines.

8. Storerooms

Formerly two. One for bolts in the men's building (now the factory office building), with one man in attendance. Main storeroom, with two men, was in detached building. Men had to go out in the rain to get parts, if it was raining.

The two units have now been combined into one, conveniently housed where the old cafeteria used to be. The detached building has been turned into a modern cafeteria.

9. Factory Offices

Once scattered all over the map, the factory executive and technical organizations are now consolidated in what used to be the men's building. Engineering, methods, time-study, and estimating are upstairs where the locker room used to be. Downstairs, where toilets, washrooms, showers, and bolt storage were once located, are production control, cost control, and payroll departments, and the factory management. The advantages of this consolidation of the control departments should be obvious.

10. Washrooms

Decentralization of washroom, toilet, and locker facilities was dictated by three main considerations. One, not a good idea to have men wandering all over the plant, especially in the present emergency. Better to keep men in their own departments. Two, long distances from workplaces to toilets involved a great deal of lost time, a condition that is undesirable at any time, let alone a time like this when every effort must be made to increase production. Three, we wanted to use the building for our new factory offices.

We now have six small washrooms, with toilets and washbowls, and four larger rooms, with toilets, washbowls, lockers, and showers, scattered strategically about the plant, for the most part in reclaimed areas. One of the larger rooms, for instance, is located in

A tremendous trifle
trebles power cable life . . .

An achievement of Anaconda research benefiting both American Industry and Defense

It is Anaconda's new construction known as Type CB*. It was born in the Anaconda laboratories when an engineer applied the principle of conditioning oil by the introduction of carbon black, in a series of experiments then being carried on.

This principle, when applied to paper-insulated oil-impregnated cable, more than trebled the life of the cable under accelerated aging tests.

The resourceful research that made this vast improvement in power cable continues unabated by the emergency. In fact, daily it strives to produce better wires and cables not only for all-important defense purposes, but also for industry at large. And although the latter may be delayed in obtaining new and improved products, when peace comes these products will be ready to go to work in the constructive cause of greater industrial progress. 41376

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ANACONDA WIRE AND CABLE

FOR SUPPLY LINES

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FOR FIRE LINES

FOR CONDENSER WATER LINES

Because J-M Transite Pipe is made of asbestos and cement, it cannot rust—will never cause troublesome "red water." Its smooth interior provides unusually high delivery capacity that can never be reduced by tuberculation—the internal corrosion that cuts down the rate of flow in ordinary pipe. Joints in Transite lines stay tight in service. And, because of its long lengths and relatively light weight, Transite is easy to handle and assemble.

For details write for brochure TR-11A. Johns-Manville, 22 East 40th Street, New York, N. Y.

JM Johns-Manville

TRANSITE PIPE

AN ASBESTOS PRODUCT

For efficient, economical industrial water lines

the space formerly occupied by the truck-painting equipment.

Quicker trips, less time wasted, fewer occasions for idle gossiping—are among the benefits. At the same time we are complying with FBI recommendations.

11. Truck Unloading

More and more of our materials and supplies are coming in by truck. This has made it necessary for us to enlarge truck receiving and loading facilities. As previously mentioned, a crane unloads stock direct from trucks to storage racks in the automatic screw machine department. (Like lots of other plants, we had good railroad facilities, poor truck accommodations.)

12. Paint and Light

As soon as any one piece of the program is completed, the painters move in. In some instances, walls and building members have never known paint. Dark and gloomy departments have been transformed overnight into easy-to-see-in workrooms. Lighting has been checked wherever a change has been made. Fluorescent units have been installed in locations where close work or inspection is done. A low power rate makes it uneconomical, however, to change over completely to this type of lighting.

13. Heating

Unit heaters have replaced central steam heat transfer units, will pay for themselves in a little over a year's time. The huge ducts needed in the old system cut out a lot of light, gathered a lot of dust.

14. Floors

We have patched up some floors, relaid others that were too far gone. One result has been the noticeable speeding up of truck movements. No need to slow up for rough spots. Less danger of spilling a load.

In connection with this, we have equipped all trucks with rubber tires. Saves trucking time, and wear and tear on floors. Strangely enough, we had always made a point of rubber tires on hand trucks we manufacture, but had not taken our own medicine!

15. Materials Handling

Much of this equipment has been alluded to in the foregoing. It is important enough to lump all in one place. Included are monorail systems in truck, steel window, and speed-reducer assembly departments; bridge

Now you can HEAT LARGE AREAS with FEWER UNITS

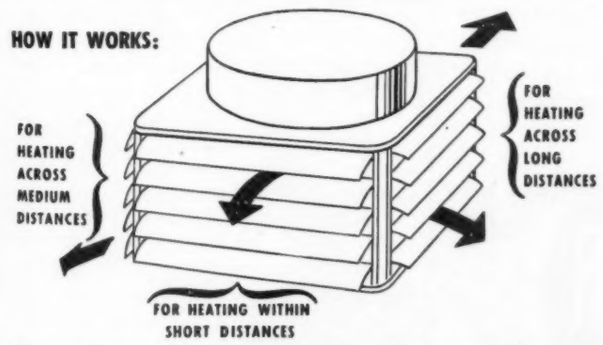
This new Carrier Unit Heater can deliver heated air in 5 directions

Carrier Unit Heating

When fully installed, this new Carrier 5-way Unit Heater will discharge heated air as far as 120 feet*. Adjustable louvers can be "set" to direct air exactly where required, either "down" or "outward and downward" or "straight outward".

**Heating 120 feet in each direction, the larger units effectively cover an overall maximum distance of 240 feet in oblong area.*

HOW IT WORKS:



For installation at any desired height up to 45 feet. Adjustable louvers on each side can then be set independently of each other. Heated air is directed exactly where you want, at the speed you want.

Lower costs! Greater comfort! For years these have been the buy-words responsible for the spectacular acceptance by industry of Carrier Unit Heaters and Carrier Heat Diffusers. And now, with a new 5-way air distribution, Carrier engineers bring you more heat at lower costs than ever before!

The latest in a long list of pioneering unit heating developments, the new Carrier 5-way Unit Heater delivers air *at any angle* from two, three or four sides, and the adjustable louvers on all sides provide downward direction of the heated air into the working zone to meet your heating requirements. Keeps more heat in greater area where needed. Result—fewer units provide more heating comfort. You save not only on first cost but also on maintenance and accessories.

The Carrier 5-way Unit Heater is the latest development in Carrier Unit Heating. You also have 21 sizes of Carrier Unit Heaters, 20 Carrier Heat Diffusers and 9 Carrier Gas Fired Unit Heaters from which to choose the best adapted unit for your requirements.

Assure yourself of maximum heating satisfaction. Take advantage of Carrier's 39 years of world-wide experience in all types of equipment that "control air". Ask your Carrier Representative to make a complete survey of your needs. Do it today!

E

The Navy "E" one of U. S. Navy's most coveted honors was awarded to Carrier management and employees for outstanding production of Navy ordnance.

CARRIER CORPORATION, Syracuse, N. Y. Desk L35
"Weather Makers to the World"

Yes! Please send me complete information describing the latest Carrier development in Unit Heating, the new Carrier 5-way Unit Heater.

Name.....

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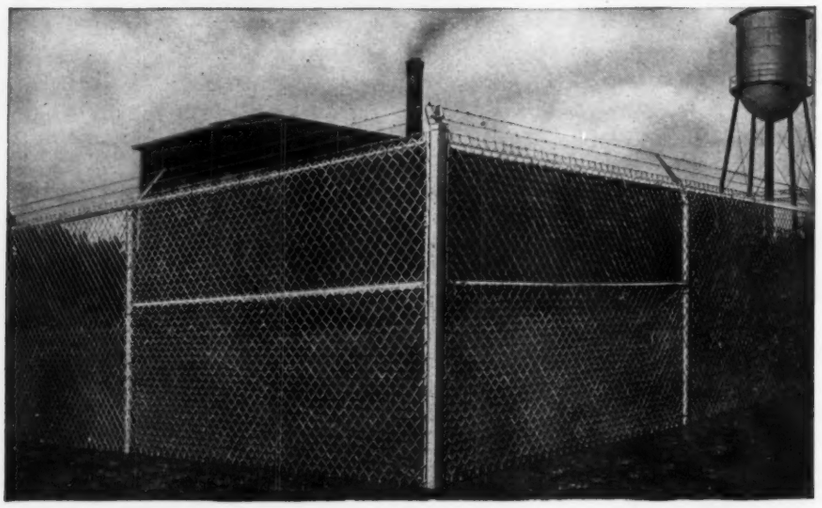
PROTECTION becomes a "MUST"

WHEN PLANNING DEFENSE PRODUCTION



And Complete Protection Calls for

1. AN ANCHOR FENCE AROUND YOUR PLANT

2. ANCHOR FENCE ENCLOSURES INSIDE

Outside and *inside* protection are BOTH necessary today to ensure "on-time" production of Defense Orders. For spies and saboteurs are seeking every opportunity to delay Defense work and steal Defense secrets. A strong, sturdy Anchor Fence around your plant provides protection against outside sabotage agencies. And Anchor Fence enclosures *inside* your plant, around power stations, transformer installations, chemical, fuel and raw material storage prevent all except your most trusted employees from reaching vulnerable points. An Anchor Fence can be quickly installed, with our exclusive "drive anchors" which keep it permanently in line in any type soil. It can be moved without loss in case of plant expansion. Send for the Anchor Engineer. He'll give you the benefit of Anchor's years of experience in fence protection—explain our Nation-wide Sales and Erecting Service—show you how to provide effective plant protection with a minimum of expense for guards and policing.

AN ANCHOR FENCE ENGINEER will gladly help you plan complete protection for your plant. Write or wire today to: ANCHOR POST FENCE CO., 6620 Eastern Ave., Baltimore, Md.

YOUR BEST DEFENSE IS AN ANCHOR FENCE

cranes for bolt and bar-stock storage; an electric-hydraulic elevator, slow but far less expensive than an all-electric lift; a fleet of jack-lift trucks to take part of the load off the power trucks. All are pulling their weight in the current drive for greater production.

16. Gates and Fences

It is perhaps symbolical of this bottleneck-busting program that the factory gate has been doubled in size to let in those huge present-day trucks.

Also, the plant is now protected by a woven-wire fence, in place of the wooden old-timer that was falling apart.

And that, so far as we have gone, is our story, but we shall reverse the usual practice and not stick to it. In other words, we stand ready to change any time we have to in order to accommodate ourselves and our plant to current conditions. We know there are many things still to be done. We are sure we have made great progress. And we wonder where we'd be if we hadn't done some of the things we're done. Our current output would not be up 2½ times. That much we can vouch for.

"Let's Go!" Say Cleveland Defense Workers

(*Continued from page 63*)

is small enough to fit into a cardcase or billfold. He receives also a sticker for the windsheld of his car.

Membership in the club is entirely voluntary but, from the response, it seems certain that every employee in all the company's plants will join.

Even before the formation of the club, however, Thompson Products' employees had demonstrated their loyalty. Last summer, when they began working on contracts for the government, groups clubbed together and purchased, by shop units, large American flags that have become fixtures in about 50 of the departments.

Another Cleveland plant, the Cleveland Graphite Bronze Company, manufacturers of bushing and bearings for airplane engines, has 41 employees who are serving their country in the military and naval forces. These men are honored by having their identification badges posted on a bulletin board in the company cafeteria, under a sign that reads "We Serve" and flanked by a draped American Flag.

Patriotic posters are used by many other firms in this city. These posters, supplied by OPM and by National

"AMERICANS" *on the ground help keep* AMERICANS *in the air!*

The American Airlines Flagship Charleston gets its oil changed at La Guardia Field—with the help of an American Pressed-Steel Hand Truck!

American Airlines has a watchword . . . and it is *dependability!* That goes for the ships themselves as well as for auxiliary equipment. Small wonder, then, that American Airlines should choose American Pressed-Steel Hand Trucks for such important ground-work as moving oil and grease drums to the ships . . . handling heavy airplane parts . . . and carting freight!

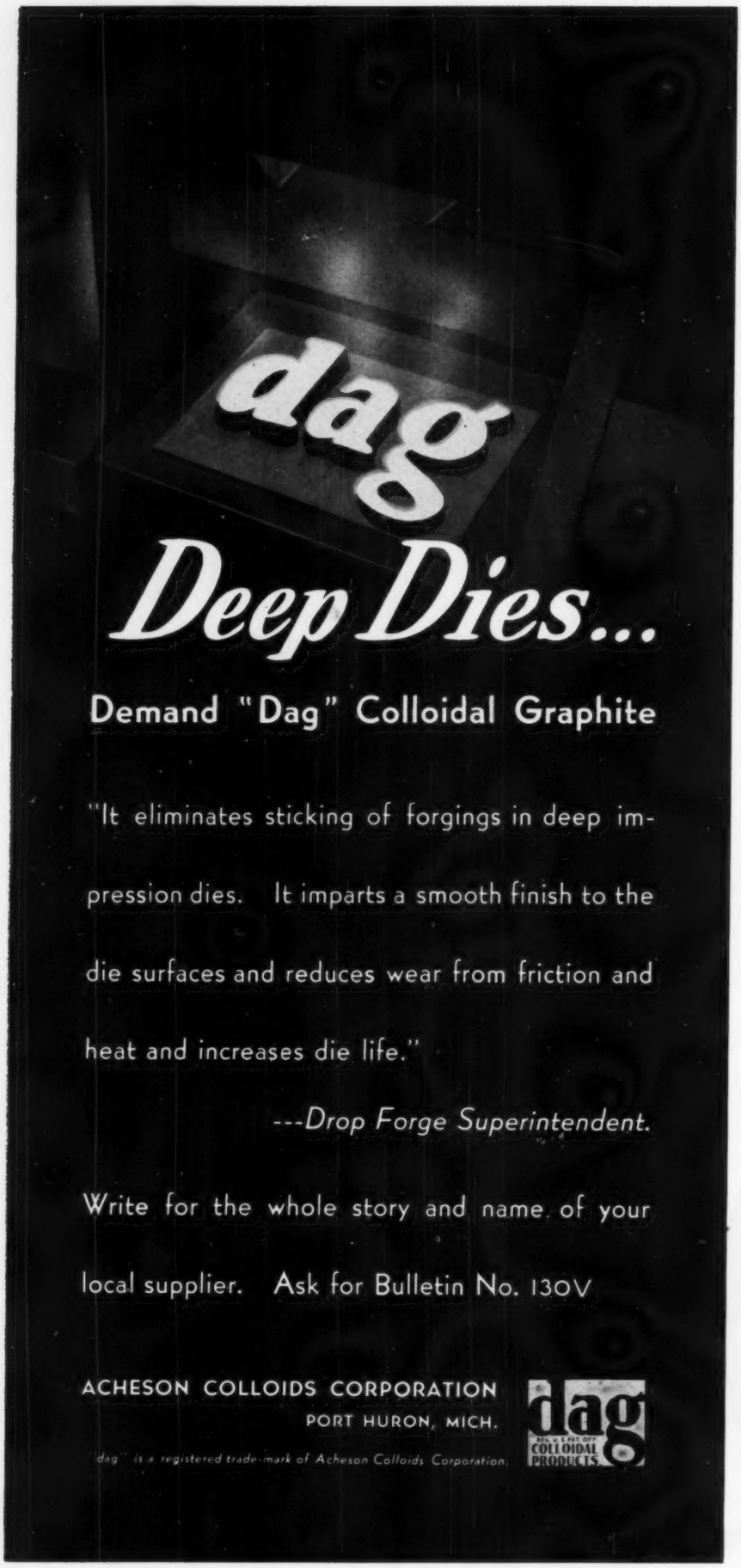
Here, at La Guardia Field, these American Hand Trucks get plenty of use and abuse. But they've got the strength and stamina of steel for the *dependability* that American Airlines demands! A little lubrication now and then—and a touch-up with paint—is all they ask to keep them going day in and day out.

"Americans" have proved that they'll *outlast* any other truck. What's more . . . they've proved that their scientific balance can help your men move *more* material with *less* fatigue! Write today for a catalog.

WEIGHS ONLY 66 POUNDS! *American Pressed-Steel Hand Trucks are lighter than you probably think! The 52" American Barrel Truck weighs only 66 pounds! It is one model in a complete line of sizes and models for every hand-truck requirement.*

THE AMERICAN PULLEY CO.
4240 Wissahickon Ave.
Philadelphia, Penna.

AMERICAN
PRESSED-STEEL
HAND TRUCKS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Deep Dies...
Demand "Dag" Colloidal Graphite
"It eliminates sticking of forgings in deep impression dies. It imparts a smooth finish to the die surfaces and reduces wear from friction and heat and increases die life."
---Drop Forge Superintendent.
Write for the whole story and name of your local supplier. Ask for Bulletin No. 130V
ACHESON COLLOIDS CORPORATION
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"dag" is a registered trade-mark of Acheson Colloids Corporation.
dag
COLLOIDAL PRODUCTS

Association of Manufacturers, are displayed on bulletin boards, and emphasize the direct tie-up between defense work and national security.

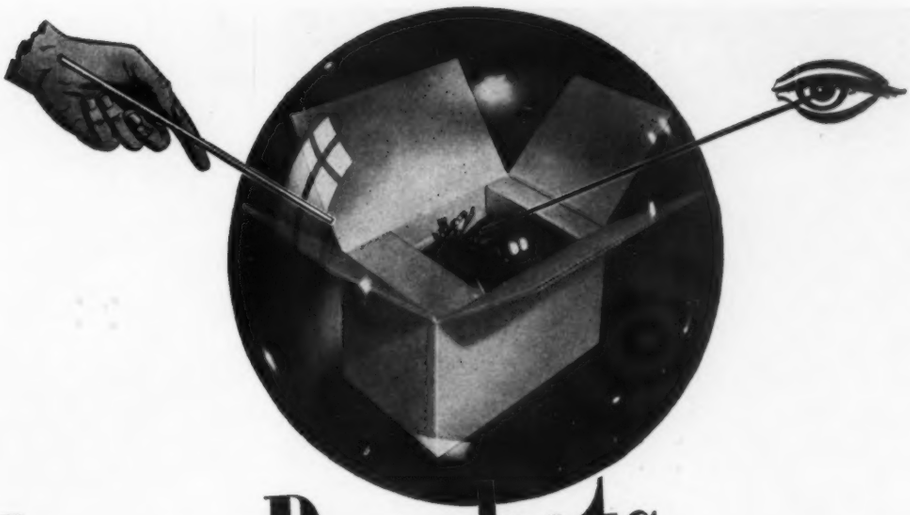
At the White Motor Company, the attention of the workers is called to the immense importance of their jobs in the national emergency by placards, which are changed frequently so that interest will not flag.

Windshield stickers and lapel buttons are given to pledge signers

The Eaton Manufacturing Company, with plants in Cleveland, and many other cities, has a regular poster service in all its plants.

In the Cleveland plant an axle-testing mechanic, Kenneth Liggett, whose regular job is to administer heavy punishment to experimental truck axles in road tests, found that a hobby that has amused him since childhood could be of real value to his fellow employees. He drew and colored a large poster titled "I pledge Allegiance," which created quite a stir among the

Posters at Eaton plants help to boost defense production



Package Prophets

for American business

HINDE & DAUCH Package Engineers . . . "prophets" in their field . . . are mobilized *now* to train their foresight on your *present* and *future* packaging problems. Trained to *anticipate* the packaging requirements of future markets, these skilled corrugated package technicians have the experience and talent to work ahead intelligently.

Although H & D's 25 mills and factories are on an "all out" schedule, producing shipping boxes for hundreds of items from munitions to motors, H & D Package Engineers can *redesign* your present package *now* . . . make it stronger, more simple, more economical to produce. Likewise, they are prepared to perfect the package you will need *tomorrow*, so that your *entire* merchandising program is ready to march when business returns to business.

What does this service cost you? Nothing. H & D is investing its "prophets" in American business. A few minutes with an H & D Package Engineer *today* may save you months *tomorrow*. Your inquiry will be given immediate attention.

H & D Package Engineers are practical packaging experts. They can redesign your present package to place still further emphasis upon economical utility.

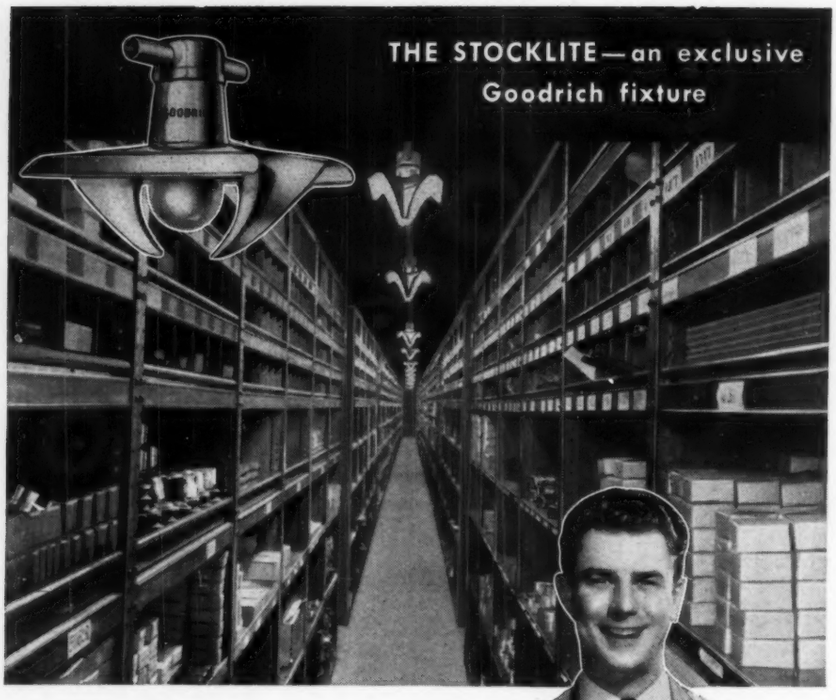
A few minutes with an H & D Package Engineer *today* will give you a head start in the competitive merchandising race of *tomorrow*.

HINDE & DAUCH *Authority on Packaging*

SAVE WASTE PAPER

4147 DECATUR STREET, SANDUSKY, OHIO

FACTORIES in Baltimore • Boston • Buffalo • Chicago • Cleveland • Detroit • Gloucester, N. J. • Hoboken Kansas City, Kans. • Lenoir, N. C. • Montreal • Muncie, Ind. • Richmond, Va. • St. Louis • Sandusky, O. • Toronto.



This IS THE *Light* FOR STOCKROOMS!

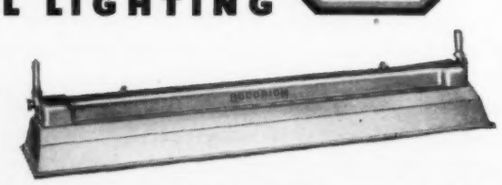
It's amazing what a difference this bright illumination makes in faster, more accurate handling of orders. Shelves are uniformly illuminated from top to bottom. Bin interiors come to life . . . stocks can't hide in dark corners. Clerks can read fine print anywhere in the aisle.

Designed for this specific purpose, the Goodrich Stocklite puts the light where it's needed; controls it; eliminates aisle glare. It's a quick, sure way to improve working conditions in any stockroom. Ask us to send you Bulletin No. 91.

GOODRICH INDUSTRIAL LIGHTING

GOODRICH RLM

HILLCREST FLUORESCENT FIXTURE—an exclusive Goodrich design with top apertures which create "daylight" conditions.



SOLD ONLY THROUGH ELECTRICAL WHOLESALERS

GOODRICH ELECTRIC COMPANY

OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 4604 BELLE PLAINE AVENUE, CHICAGO, ILL.

Posters in all Eaton plants are changed every two weeks

workers in his plant. Through the personnel department, this poster came to the attention of management, and copies of it were made for display in the company's other ten plants. Immediately came the request for more, and a studio was set up for reproducing Liggett's posters. Now he divides his time between road tests and making posters.

To foster interest in the posters, the company paper *The Eaton News* announced that ideas and suggestions for posters would be welcome. A flood of suggestions and drawings immediately came in from all plants, showing a depth of patriotic feeling among the defense workers.

In further recognition of the part employees are playing in the defense program, the plant newspaper carries a special column in each issue, which lists the names of all who have joined the military or naval service. In the latest issue, 86 men were named.

Also an official announcement, over the signature of J. O. Eaton, chairman of the board stated that each employee who joined up would (1) retain his seniority, and count his military service the same as active service for the company; (2) receive his vacation or bonus pay; (3) receive a special bonus of $100, in four installments; (4) have his group life insurance kept up by the company unless or until war is declared.

Thus, in these and many other establishments throughout the country, are the fires of patriotism kept burning, through the friendly cooperation of employees and management.

BWH

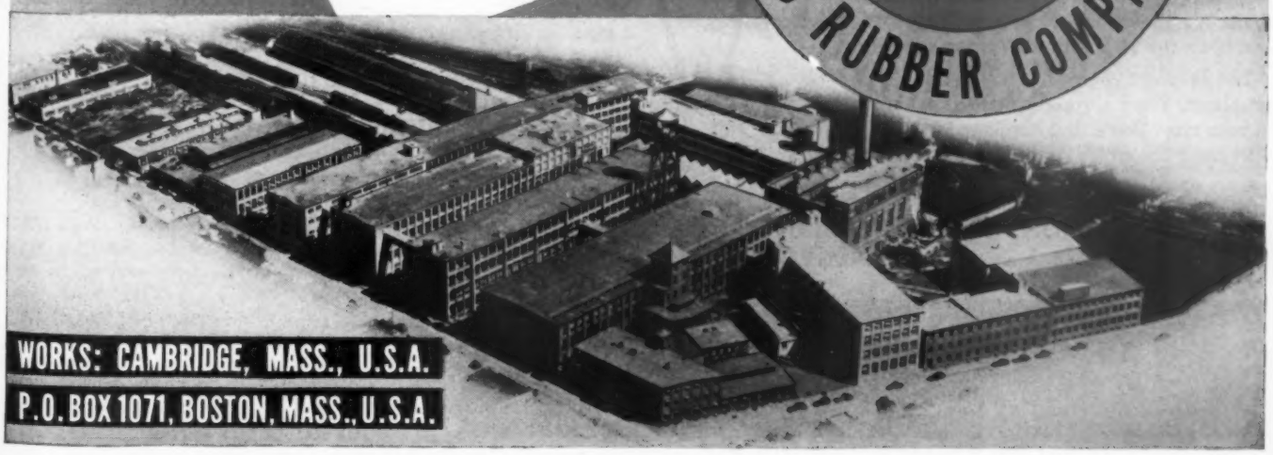
Built With Honor

. . . the symbol of a line of mechanical rubber goods, and of the firm that makes them. You have been accustomed to rely on both the goods and the firm to do their part in industry; you can as confidently rely on them to do their part in the service of the nation, now that this is necessary.

That service must be given in part with men, materials, and machinery which would ordinarily be at your command. You can still command, however, our willingness and effort to serve you to the best of our ability, now and in the future, as fully as we can. And you can be assured that our service, whether to you or to the nation, will be Built With Honor.

BOSTON WOVEN HOSE AND RUBBER COMPANY

BWH



WORKS: CAMBRIDGE, MASS., U.S.A.

P.O. BOX 1071, BOSTON, MASS., U.S.A.

For HIGH-SPEED PRODUCTION Use **WRIGHT** *High-Speed HOISTS*

● Engineers in every industry are turning to WRIGHT for high-speed vertical and horizontal transportation. They know WRIGHT hoists are engineered for *fast,* high-speed work. They know WRIGHT hoists are built to do their work rapidly, efficiently, smoothly. They know them to be *safe* and *economical,* too.

Furthermore, they know WRIGHT engineers are well qualified to give you specialized service. WRIGHT men have studied and solved hundreds of individual hoisting problems, then designed and built hoists to fit.

WRIGHT TROLLEYS are made to give the same *fast, economical, safe* service as WRIGHT hoists. Write for your copy of the new WRIGHT Catalog and learn the 21 points of WRIGHT superiority.

Let WRIGHT engineer your hoisting and crane problems. Work through the WRIGHT distributor in your city. You'll find him listed in the classified telephone book.

ACCO

WRIGHT MANUFACTURING DIVISION
YORK, PENNSYLVANIA

AMERICAN CHAIN & CABLE COMPANY, Inc.
In Business for Your Safety

Management Shorts

(*Continued from page 78*)

shaped clamp, then twisting at the point where the weld would ordinarily be made. Uprights are bolted to a channel iron section, one upright with two bolts, the other with one. The fixed-position upright may be welded to the channel, if preferred.

A block of wood to which padding has been attached is inserted in the channel and secured in position by screws.

●

Sign Warns Welders To Wear Goggles

R. A. SHAW, Director of Safety, The Murray Corporation of America, Detroit

While the eye hazards encountered in arc, gas, and acetylene welding with oxygen are well known to experienced welding operators, newly recruited workers are not always aware of them, nor appreciative of the safety equipment provided for their protection.

In order to make these workers "goggle conscious"—to build up their respect for the equipment and to insure its use—the sign shown in the illustration was put up at the door of the welding booth. It acts as a constant reminder to all those entering that goggles must be worn in the booth if eyes are to be safeguarded against injurious rays.

●

Wheelbarrow Lift Truck for Tough Trucking

E. H. TRICK, San Antonio, Tex.

Where floors are soft, uneven, and not adapted to the use of low-clearance lift trucks, an elevating wheel barrow can be put to good use.

The particular application for which this wheelbarrow was designed was in our foundry casting-cleaning department. Floors around the grinding wheels are soft and often strewn with small castings and broken cores, a condition that does

Photo by McCord Radiator & Mfg. Co.

Official U. S. Signal Corps photo

Battle Bonnets FOR '42!

● Here's the latest style in headgear for the well-dressed soldier—the new Model M1 Steel Helmet that McCord Radiator & Mfg. Co. of Detroit is now manufacturing for the United States Army. It's a vast improvement over the old "tin derbies" of 1917. It's shaped for extra protection, and its special alloy steel turns a .45 calibre bullet at six feet.

Painting these steel helmets inside and out is a top-speed job, to meet McCord's fast production schedule. An exacting job, too, because granular cork is mixed with the outside covering to kill light reflection. And McCord has solved the problem by installing a DeVilbiss automatic spray painting machine that turns them out fast enough to equip an army division a day.

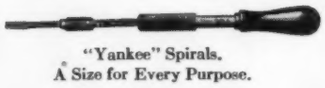
DeVilbiss Spray Systems are helping manufacturers in every industrial field to meet the unprecedented demands of all-out defense production. On every type of equipment or munitions that is painted for protection, maintenance, identification, decoration or camouflage, DeVilbiss Spray Guns are helping to speed the tremendous task of arming the forces of democracy.

THE DEVILBISS COMPANY • Toledo, Ohio
Canadian Plant: WINDSOR, ONTARIO

THE COMPLETE DEVILBISS LINE CONSISTS OF: Spray finishing equipment • Automatic coating machines • Tanks for spray materials • Spray booths and exhaust fans for vapor and dust elimination • Air regulators, cleaners and dusters • Air compressors • Respirators • Specialized hose for paint, air, water, gasoline, welding and pneumatic tools • Hose connections • Water and oil guns • Equipment to prevent offset in printing • Paint stripers • Medicinal atomizers • Perfume atomizers.

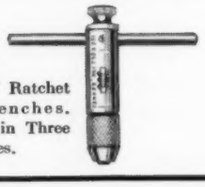
DEVILBISS SPRAY SYSTEMS

SPEEDING PRODUCTION
with
"YANKEE"

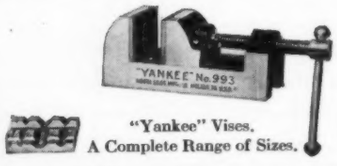


"Yankee" Spirals.
A Size for Every Purpose.

"Yankee" Ratchet Hand Drills. With Five Ratchet Adjustments.



"Yankee" Ratchet Tap Wrenches. Available in Three Sizes.



"Yankee" Vises.
A Complete Range of Sizes.

Driving screws quickly . . . tapping threads easily . . . speeding up milling jobs and drilling in tight quarters . . . Operations such as these are all in the day's work for "Yankee" Tools, the first choice for many years with industrial users.

Stepping up production for National Defense is the theme today. Naturally, then, the time and labor-saving qualities of "Yankee" tools have, more than ever before, made them standard equipment with the Aviation Industry.

Write for "Yankee" Tool Book FMM

"YANKEE" TOOLS
Make good Mechanics Better
North Bros. Mfg. Co., Phila., Pa., U. S. A.

not permit the ready use of lift trucks. The use of this wheelbarrow overcame all our difficulties.

An ordinary steel wheelbarrow, minus the pan, is the basis of this device. To it are added certain levers, bell cranks, and other parts, whose function is to elevate a flat steel bar, placed forward of and above the wheel several inches.

The pans or containers used in conjunction with it are made with legs of sufficient length to permit the barrow with its elevating bar in the "down" position to be pushed beneath them. This done, the operating lever is pulled down and hooked under the right-hand handle of the barrow. This raises the rear legs resting on it. The operator then lifts the handles of the barrow in the usual manner and the pan then rights itself to an approximately level position. The operator can then wheel the barrow over soft floors strewn with obstructing objects, the dependent legs of the pan clearing the floor by several inches. It is a distinct advantage to be able to take the contents of the pan through mud and water of the outdoor areas.

The pans are made just wide enough so that the barrow will pass snugly between the legs, with no side slippage.

Tension springs hold the elevating mechanism in reverse, with the elevating bar in its "down" position when not in use. This prevents careless operators from trying to jam the barrow under the pan

with the bar up, thus ruining its alignment.

Hooked-shaped catches on the pans hold barrow and pan in correct traveling position so that the pan will not be danced off the barrow by the vibrations imparted by rough, uneven floors. The entire device is as rugged in construction as the steel barrow itself, is no more subject to wear than it is, and requires no more attention to maintain.

Our own application of this device involves placing several pans in line near the grinding wheels. The operators grind the castings and toss them into the pans; when a pan is filled a truckman pushes the elevating barrow under it and makes off to the machine shop, returning with an empty pan.

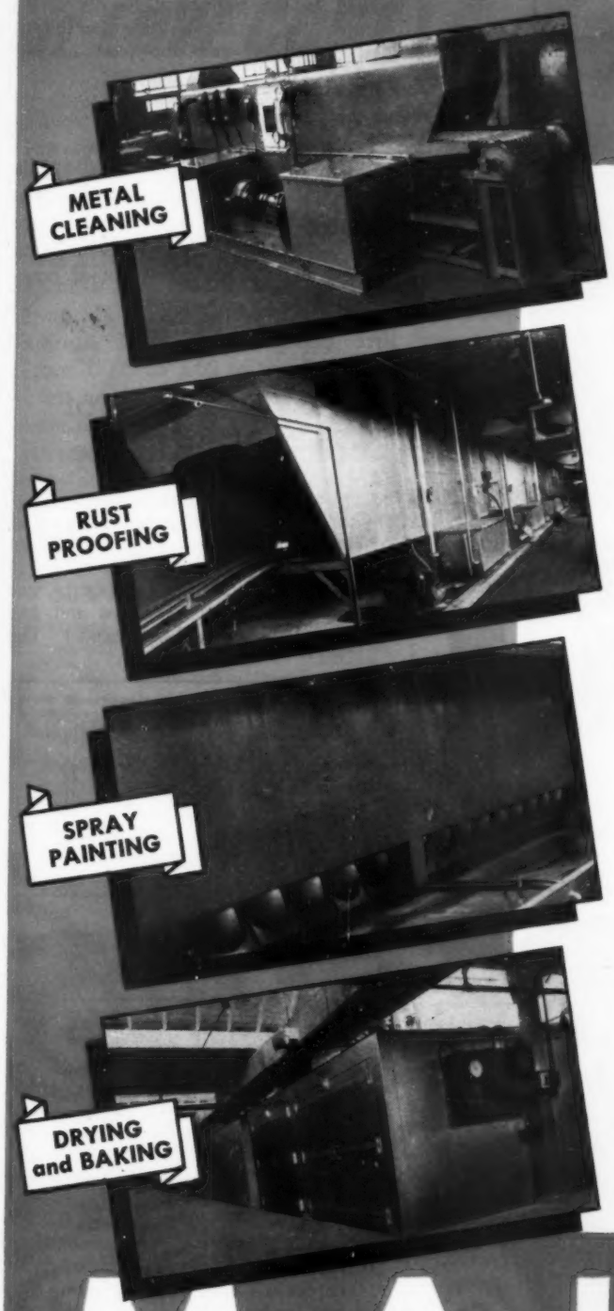
By fitting tote pans into the truck pans several kinds of castings in small quanti-

When Mahon Engineers . . .

. . . PLAN . . . BUILD . . . INSTALL . . .

COMPLETE *Finishing* EQUIPMENT

TO FIT *Your* EXACT REQUIREMENTS,



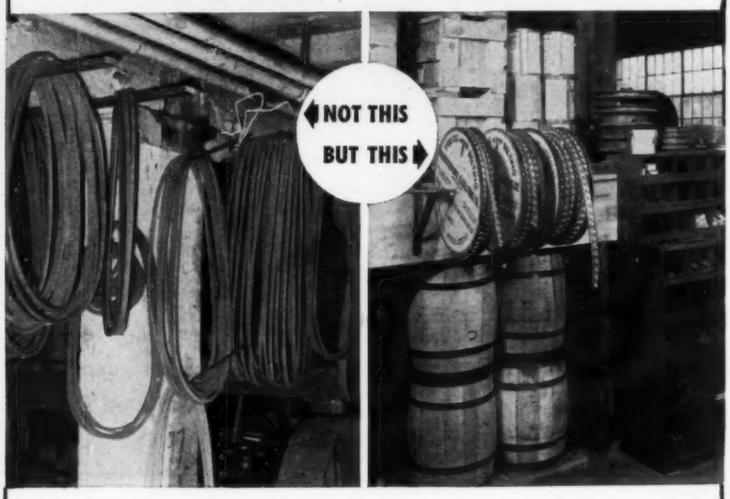
You Save Both Hours and Dollars

The reason so many alert manufacturers are replacing obsolete Finishing Equipment with modern machines and methods is the SAVING effected in production time and money—in short, *greater operating efficiency*. Operating efficiency depends largely upon the practical experience and the knowledge of the organization that plans and builds the equipment. Weigh this factor carefully when considering the purchase of such equipment—which so directly affects profitable production in your plant. Save production hours and dollars in your Finishing operations by relying on Mahon to plan, produce and install a properly engineered, thoroughly coordinated, dependable Complete Finishing System. Consultation with Mahon engineers costs you nothing. Let these Finishing experts make a survey for you without delay.

THE R. C. MAHON COMPANY
DETROIT — — CHICAGO

Designers and Manufacturers of Complete Finishing Systems, Metal Cleaning Machines, Rust Proofing Machines, Hydro-Filter Spray Booths, Ovens of All Types, Filtered Air Supply Units, Hydro-Foam Dust Collectors and Many Other Units of Special Production Equipment

MAHON



See for yourself how Veelos in *rolls* saves stockroom space and inventory detail... ends the need for large surplus stocks of V-Belts.

But even more important, Veelos in handy rolls eliminates the hazard of production delays caused by belt trouble. You adjust Veelos in a matter of seconds . . . completely install a new belt in a few minutes. Veelos in rolls provides an automatic supply of matched V-Belts of any length . . . assures continuous production. Your distributor knows.

CALL A V-MAN! A better belting set-up may give you higher production per man and per horsepower. Consult a Veelos V-Man. He's a sales engineer especially trained in power transmission work. Comes on the run!

MANHEIM MANUFACTURING & BELTING COMPANY
MANHEIM, PA.

VEELOS
V-BELT
ADJUSTABLE to any length
ADAPTABLE to any drive

FLASH!

NEW OCTOPUS FLAT TRANSMISSION BELTING REDUCES SLIP BY MEANS OF MORE POWERFUL GRIP! FLASH! STRETCH ELIMINATED BY GREATER RESILIENCE! FLASH! OCTOPUS BELTING IS THE PRODUCT OF EIGHT YEARS' INTENSIVE RESEARCH!

ties may be kept separate, easily counted, and delivered to different destinations.

Although the center of gravity of the load is somewhat higher than that of the ordinary loaded wheelbarrow, the long-legged pans are surprisingly stable, and 300-lb. loads are easily transported over rough ground.

Some idea of the lightness of the entire ensemble may be gained from knowing that the sides of the pans are made of No. 16 gage steel, the bottoms of No. 10 gage, and the legs of 1½x⅛-in. angles. The wheelbarrows cost very little to make.

The illustration shows the barrow under a pan, the operating lever down and locked to the right-hand handle of the barrow, the front elevating bar in its raised position, and the load elevated ready to go.

•

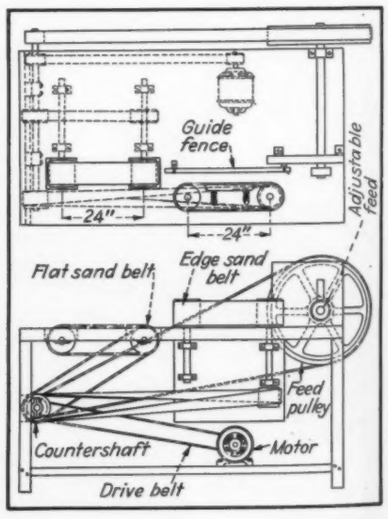
To inform stockholders about its products one company attaches to each dividend check inclosure a photograph of one of them. Under the picture is a brief comment on the product.

•

Sands Two Sides of Door Trim at Once

G. J. NELSON, Superintendent, Dakota Sash and Door Company, Aberdeen, S. D.

In the past, it was our practice to sand all the back band for window and door trim on the regulation belt sander. This



is a slow process. I conceived the idea of making a sander to sand two sides of the back band at once.

We made a combined edge sander and flat belt sander. On this machine we use 2½-in., No. 0 sandpaper belts, and run material at a speed of 20 feet per minute. This is 100 percent faster than the old method. The machine is run by a 3-hp. motor, material going through is self-fed.

New, Improved Line of Power Feed DRILL PRESSES

offers you many advantages at LOW COST!

These new Delta Power Feed Drill Presses quickly pay for themselves in time saved and reduced operating costs. The unusual design of the power feed unit, which operates directly off the bottom drive of the motor instead of off the spindle, makes possible a wide range of feeds, from .0010 to .016 inches per revolution of spindle in the Slow-speed drill presses and from .0005 to .009 in the High-Speed machines. The heart of the power feed is the husky bronze gear and the specially hardened and ground steel worm that assure positive accurate stopping and long satisfactory service.

Other Special Features Include:

1. Quick traverse by hand from starting position to work;
2. Instant switching from power to hand feed and reverse without changing or removing parts;
3. Safety lock for preventing damage to drill press when power feed is disengaged;
4. Adjustable automatic stop and return.

This new line includes single and multiple spindle 17" units, in slow speed and high speed models, with table-raising or head-raising mechanisms, powered with either Delta or standard NEMA frame motors—all priced considerably lower than the customary price ranges for drill presses of this quality.

WRITE for Power Feed Drill Press BULLETIN

Giving complete details, specifications and prices on the new line of Delta 17-inch Power Feed Drill Presses.

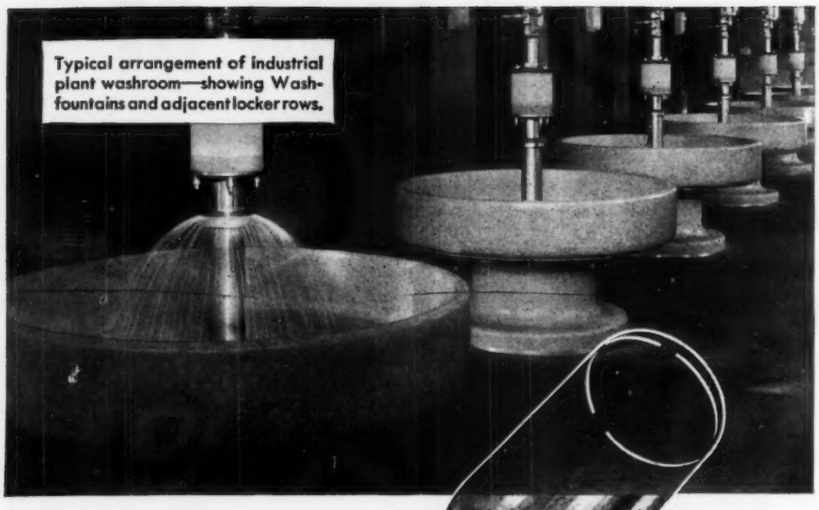
DELTA
MILWAUKEE

DELTA MANUFACTURING CO.,
617-N East Vienna Ave.
Milwaukee, Wisconsin

Please send me Special Bulletin on the new line of Delta 17-inch Power Feed Drill Presses.

Name.....

Address.....



Typical arrangement of industrial plant washroom—showing Washfountains and adjacent locker rows.

DON'T LET THE WASHROOM BE ANOTHER BOTTLENECK

★Dermatitis, according to physicians, heads the list of industrial diseases. Proper washing and bathing are effective preventive measures.

● Adequate, sanitary washing facilities are necessary to provide for your growing force—and to keep that force on the job.

Bradley Washfountains are providing such facilities in thousands of plants. More than five million hands of industry are washed daily at Bradleys.

The central spray serves clean, running water to each of 8 to 10 persons simultaneously. The spacious deep bowl is self-flushing to prevent collection of water and possible contamination.

Bradleys thus save space, reduce piping connection 70 to 90 per cent, reduce chance of skin affections that may spread and cause many lost man-hours.

Bradley Washroom Consultants to Help You

Let our experienced Washroom Consultants help you extend your present washrooms or lay out new ones. Their suggestions will save your time and assure the maximum facilities in given space. Bulletin 4010 will be mailed on request . . . BRADLEY WASHFOUNTAIN COMPANY, 2215 W. Michigan St., Milwaukee, Wis.

Seven men washing at a Bradley 54-inch circular Washfountain. To show the spray, sprayhead and soap dispenser, men were cleared from side nearest camera.

BRADLEY washfountains

BOOKS

INDUSTRIAL ACCIDENT PREVENTION

H. W. Heinrich, assistant superintendent, engineering and inspection division, The Travelers Insurance Co., McGraw-Hill Book Co., 330 W. 42nd St., New York. 448 pages. Photographs, bibliography, index. $3.

Second edition. Methods of accident prevention advocated in original edition of the book, published in 1931, have been proved sound in principle and practicable of application. Chapter headings include "Principles of Accident Prevention," "Basic Philosophy of Accident Prevention," "Creating and Maintaining Interest in Safety," "Machine, Prime Mover, and Power Transmission Guarding," "Fatigue," "Accident Statistics," "Education of Employees," and others.

EFFECTIVE FOREMANSHIP

Harold B. Maynard, president, Methods Engineering Council, Inc. McGraw-Hill Book Co., 330 W. 42nd St., New York. 263 pages. Index. $2.50.

Compiled by fifteen experts to guide foremen who are just assuming new responsibilities, and to help more experienced men improve their abilities. Each chapter is followed by a series of questions for discussion.

SHOP MANAGEMENT FOR THE SHOP SUPERVISOR

Ralph Currier Davis, professor of business organization, The Ohio State University. Harper & Brothers, 49 E. 33rd St., New York. 333 pages. Diagrams, forms, index. $2.

Concerned with the problems which face the shop supervisor. Contains chapters on management and the industrial organization; plant and equipment; production control; quality control; motion and time study; materials control; plant maintenance; labor management; and others.

FATIGUE OF WORKERS

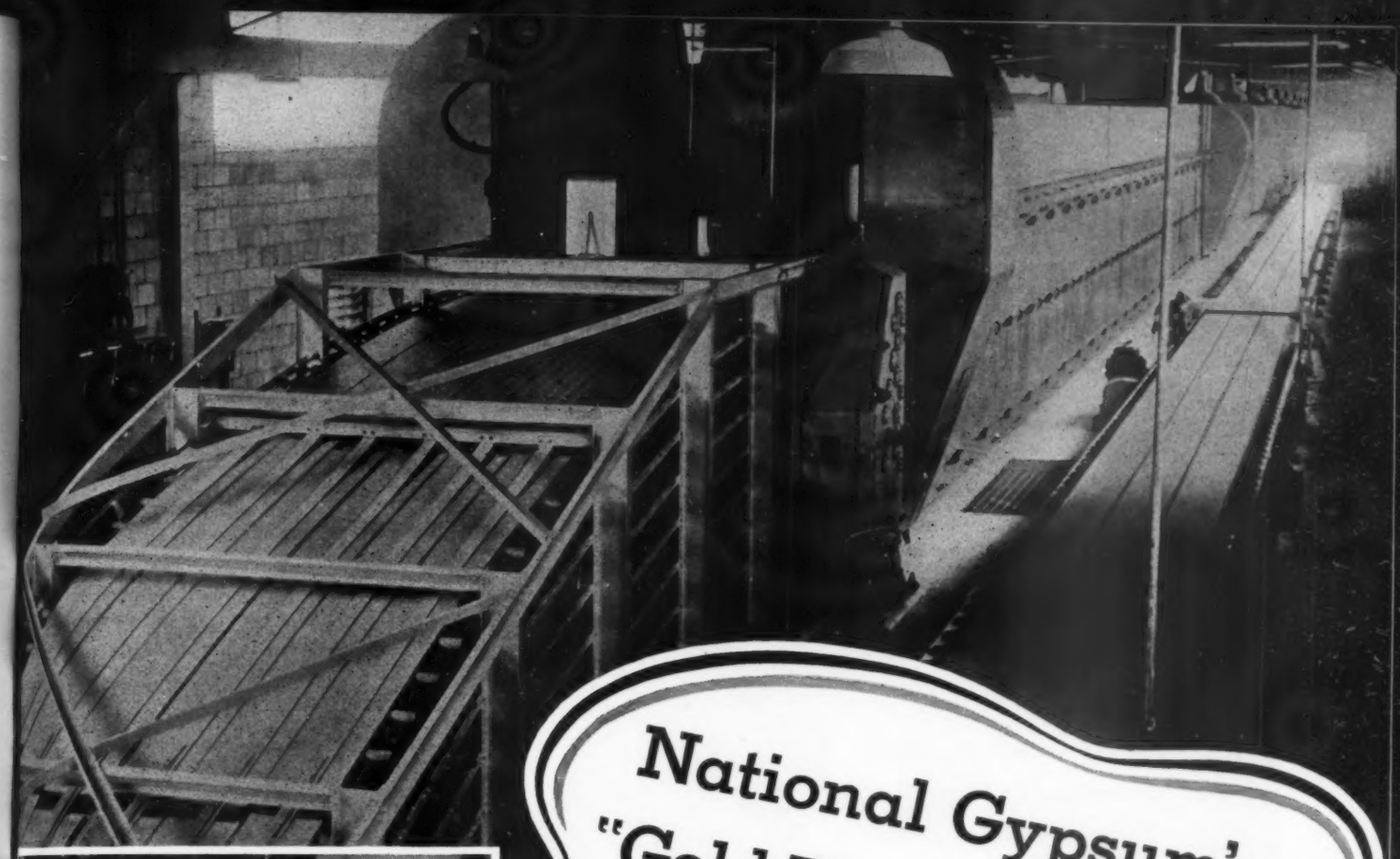
Committee on Work in Industry, National Research Council. Reinhold Publishing Corp., 330 W. 42nd St., New York. 165 pages. $2.50.

Report of investigation made to determine the physical and mental reactions of industrial workers to the conditions they are exposed to in their daily work. Reveals not only the direct causes of fatigue but also the psychological origin of strikes, slowdowns, and voluntary limitation of output by workers. Ways in which the inharmony which often exists between management and labor can be overcome are indicated.

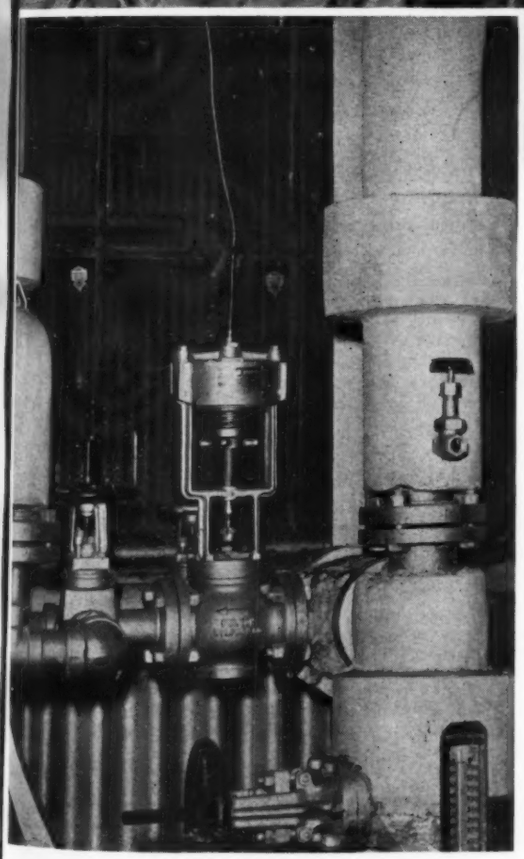
COLLECTIVE WAGE DETERMINATION

Z. Clark Dickinson, professor of economics, University of Michigan. The Ronald Press Co., 15 E. 26th St., New York. 640 pages. Charts, tables, index. $5.

Problems and principles in bargaining, arbitration, and legislation, answering the question: How can labor's rightful demand for



National Gypsum's "Gold Bond" is Better... *Thanks to Sylphon Control*



Forty per cent of the weight of gypsum board after formation is moisture which must be dried out slowly and uniformly. National Gypsum Company, producers of "Gold Bond" wall and ceiling board, rely on Sylphon Control to accurately regulate the temperature in the giant 600-ft. steam-heated dryer shown above.

Between 30,000 lbs and 40,000 lbs of steam per hour is required by this dryer and the Sylphon Control, operating on the temperature of the condensate return, maintains the desired temperature in the dryer at all times and prevents the system from filling up with water.

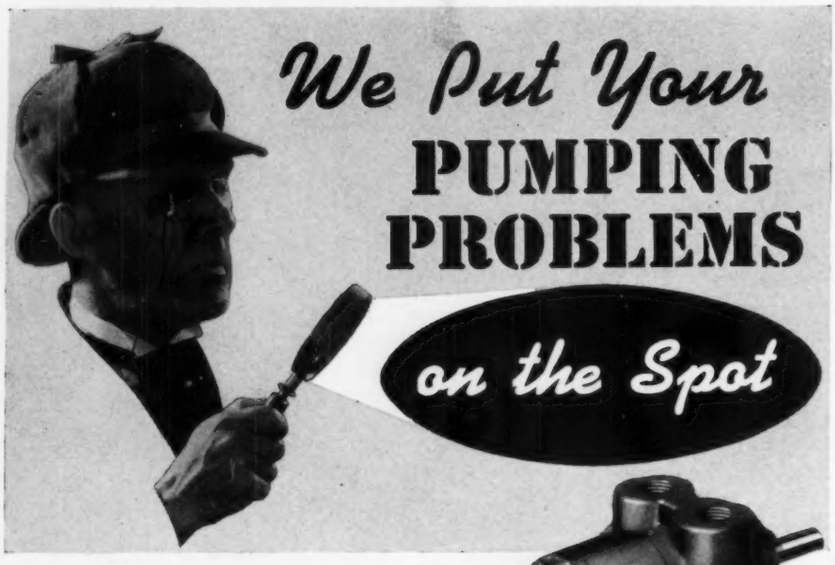
Self-powered, Sylphon Controls provide the reliable, automatic temperature regulation so vital in many industrial processes. Over 200,000 installations have proved their dependability. They may be the answer to your temperature control problem. Write for Bulletin XF-20.

FULTON *Sylphon* TRADE MARK FOR TEMPERATURE CONTROL

THE FULTON SYLPHON CO.

KNOXVILLE, TENNESSEE

Representatives in All Principal Cities in U. S. A. and in Montreal, Canada and London, England



Let Roper Pumps eliminate your pumping worries . . . from the hundreds of different standard Roper Pumps available you can select practically a custom-built pump to handle your particular job with the highest degree of efficiency and at the lowest cost.

HYDRAULICALLY BALANCED

Eight Series of Pumps

with capacities ranging from one to 1000 gallons per minute, pressures up to 1000 pounds per square inch, speeds up to 1800 r.p.m., 21 drives and mountings, and 8 piping arrangements. Roper Hydraulically Balanced Pumps are tops in performance . . . low in cost.

Write for Catalog No. 938 with illustrations, cutaway views, drawings, dimension and pumping capacity tables, and complete information on Roper Pumps.

GEO. D. ROPER CORP., ROCKFORD, ILL.

ROPER Rotary PUMPS

greater job security and freedom through organization be met, with a minimum of cost inflation and anti-social restriction? In five parts: 1. Survey of the Field; 2. Factors Commonly Invoked in Collective Wage Adjustment; 3. Wages and Industrial Fluctuations; 4. Wage Policies and Practices in Private Collective Bargaining; and 5. Influence of Public Policy on Wages.

INDUSTRIAL INSTRUMENTS FOR MEASUREMENT AND CONTROL

Thomas J. Rhodes, engineer, The Procter & Gamble Co. McGraw-Hill Book Co., 330 W. 42nd St., New York. 573 pages. Diagrams, tables, charts, index. $6.

Intended as textbook for formal study of instruments and automatic control, and as a practical reference book. No attempt has been made to include material on all types of instruments, but rather to use only descriptive material that helps to make clear the theory being studied or that represents a different solution of a particular problem.

PRACTICAL LESSONS IN ARC WELDING

W. J. Chaffee. Hobart Brothers, Troy, Ohio. 100 pages. Photographs, figures, drawings. 50c.

Offers students, instructors, and engineers practical arc welding data and lessons. Forty-two arc welding lessons are covered, including: Striking and manipulating the arc; welding with bare electrodes; welding and cutting with coated electrodes; welding light-gage steel; and others.

THE FEDERAL WAGE AND HOUR LAW

Arthur W. Nevins. National Foremen's Institute, Inc., Deep River, Conn. 58 pages. $1.50.

Information in question and answer form that gives up-to-the-minute rulings on the wage and hour law. Chapter headings include: "Covered Employee," "Exemptions," "The Employer-Employee Relationship," "Minimum Wages," "Working Time," "Overtime," "Records," "Child Labor," "Enforcement."

REPRESENTATIVE CLAUSES PERMITTING WAGE ADJUSTMENTS DURING THE LIFE OF THE AGREEMENT

Industrial Relations Section, Department of Economics and Social Institutions, Princeton University, Princeton, N. J. Mimeographed report, 12 pages.

Of 201 labor agreements reviewed, 46 had included a provision whereby a wage adjustment could be made during the life of the agreement. Treatise sets forth 22 typical clauses.

THE ESSENTIALS OF OCCUPATIONAL DISEASES

Jewett V. Reed, B.S., M.D., F.A.C.S., and A. K. Harcourt, B.S., M.D. Charles C. Thomas, Springfield, Ill. 225 pages. Chart of industrial health hazards, bibliography, index. $4.50.

Extensive study of occupational diseases, with symptoms, diagnosis, and treatment. Divided into seven sections: Chemical Poisons, Physical Agents, Skin Lesions of Occu-

"NO WONDER I WAS SKEPTICAL

...WHEN YOU RECOMMENDED LESS EXPENSIVE EQUIPMENT"

No. 3—*An Actual Experience from the sales records of* COMBUSTION ENGINEERING CO., INC.

1. Plastics plant four years ago needed additional steam. Existing equipment was 3 C-E Heine Boilers, 3 C-E Type E Stokers which had been in service for 21 years. A fine record, so naturally C-E is called in.

2. Since the boilers are in first class shape, it should suffice to modernize the fuel-burning equipment. Customer favors multiple retort stokers. They're more expensive, require major changes but a sensible choice.

3. From wide experience, C-E Engineers foresee how, with only minor changes to boiler setting, grate area may be increased 25%; and larger, less expensive Type E Stokers used; same as served so well for 21 years.

4. The money to be saved appeals to the customer but he's skeptical. Will the less expensive modernization deliver the steam? Will it reach the efficiencies predicted by C-E engineers? He's still dubious.. until..

5. ... the C-E salesman shows how impartial his proposal is. For C-E has multiple retort stokers, too; splendid modern design. They do offer advantages but not enough in this case to justify the higher cost.

6. Four years after the installation was made by C-E. The plant is getting the steam it needs and at higher efficiencies. Fuel savings *alone* had paid for complete modernization at the end of three years' operation.

The advantages you gain, by discussing your steam generating problem with C-E, are emphasized by this actual case history. The wide experience of C-E Engineers with every size and type of installation qualifies them to determine the most satisfactory and economical solution of your problem. Then with the world's most complete line of steam generating equipment at their disposal, C-E Engineers are able to recommend the type of installation that's ideally suited to the conditions in your plant.

World's Most Complete Line of Steam Generating and Related Equipment for all Industrial Service

C-E

BOILERS • STOKERS • PULVERIZED FUEL SYSTEMS
FURNACES • STEAM GENERATING UNITS
SUPERHEATERS • AIR HEATERS • ECONOMIZERS
DRYING AND INCINERATION SYSTEMS
• CHEMICAL RECOVERY UNITS •

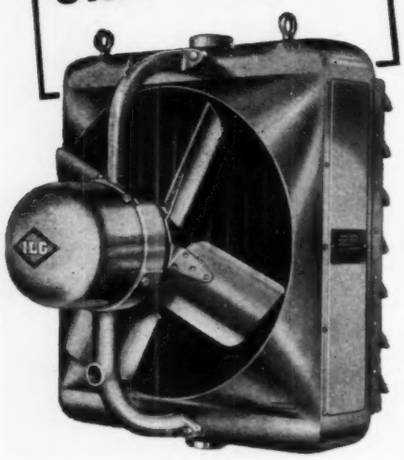
COMBUSTION ENGINEERING COMPANY, INC. 200 MADISON AVE. NEW YORK, N. Y.

A-619

TROUBLED WITH HEATING

HEADACHES?

Rx ...go to GraybaR FOR ILG UNIT HEATERS



Space limitations, heavily banked overnight fires, uneven temperatures, unhealthy working conditions, red-hot radiators ... are all heating headaches of the past. ILG Unit Heaters eliminate each of these and save money in doing so.

Ask your GRAYBAR Man to show you how the ILG saves 15 to 25% in fuel cost, 100% on floor or wall space, 5 to 10% on power. Also, how it protects stocks from deterioration due to sudden temperature changes, and how it cuts down layoffs due to winter illnesses. Let him show you how much you would save by installing "Vital Zone" ILG Unit Heaters in your plant and offices.

With production lines humming as they are today, winter heating takes on an even more serious complexion than usual. So play safe—see your local GRAYBAR Representative at your earliest opportunity and let him help you with your particular heating problem.

Executive Offices:
Graybar Bldg.
New York

Distributed by GraybaR ELECTRIC COMPANY

GraybaR

IN OVER 80 PRINCIPAL CITIES

pational Origin, Occupational Diseases of the Lungs, Malignant Disease Associated With Occupation, Occupational Diseases Due to Infections, Functional Disturbances Associated with Occupation.

NEW ENCYCLOPEDIA OF MACHINE SHOP PRACTICE

George W. Barnwell, editor, professor of production practice, Stevens Institute of Technology. Wm. H. Wise Co., Inc., 50 W. 47th St., New York. 561 pages. Forms, tables, schematic drawings, index. $1.98.

A guide to principles and practice of machine shop procedure, including chapters on bench work, metals in engineering production, lathe milling and grinding, welding, soldering, and brazing, measuring, and testing, and others.

WE NEED VITAMINS

Walter H. Eddy, Ph.D., and Gessner G. Hawley. Reinhold Publishing Corp., 330 W. 42nd St., New York, 102 pages. Tables, appendix. $1.50.

A study of what vitamins are, and what they do. Explains chemical and physical properties, how potency is determined and expressed, how effects are accomplished, how much is needed daily, where and how to get the needed vitamins.

ELECTRICAL WIRING SPECIFICATIONS

Earl Whitehorne. McGraw-Hill Book Co., 330 W. 42nd St., New York. 181 pages, tables, photographs, diagrams, forms, index. $2.50.

Prepared with the collaboration of the editorial staff of "Electrical Contracting." Book reviews design and specification procedure, discusses the use of specifications in selling, sets down guiding rules for planning and specifying wiring systems for all types of buildings.

A.S.M.E. MECHANICAL CATALOG AND DIRECTORY, 1942

Published by the American Society of Mechanical Engineers, 29 W. 39th St., New York. 537 pages. $3.

Thirty-first annual edition. In four sections: Catalogs, containing descriptions of hundreds of items used by industry; directory, indicating the source of equipment and machinery needed by the mechanical engineer; trade names, consisting of an alphabetical list of trade names; A.S.M.E. publications, supplying information about A.S.M.E. Codes, standards, periodicals published by the Society.

EYE HAZARDS IN INDUSTRY

Louis Reznick. For the National Society for the Prevention of Blindness by Columbia University Press, New York. 321 pages. Photographs, tables, bibliography, index, $3.50.

Extent, cause, and means of prevention of industrial accidents that cause eye injuries. Intended for safety engineers, safety inspectors, and anyone actively interested in accident prevention, and also for use as a textbook in engineering schools, for vocational training advisers, and others who are preparing youth for work in industry. In two parts: (1) "The Problem," subdivided into chapters on hazards, accidents, diseases of the eyes, defec-

Which Would You Rather Buy ?

A New Valve — or — Renewable Seats

Thousands of dollars worth of brass gate valves are consigned to the scrap heap every year when they are as good as new except for a leaky seat. But it's different with Fairbanks *Renewable* Valves. They eliminate that waste. Instead of throwing away a Fairbanks "Renewable" Bronze Gate Valve when the seat rings finally become worn, you can quickly slip in new ones—and the valve is as good as new at about 10% of what a new valve would cost. This takes only a few minutes—just long enough to unscrew the bonnet and slip in a new ring. And that can be done without removing the valve from the pipe line.

Contrast this quick, easy and inexpensive renewal with non-renewable valves that have the seats cast integral with the body.

Quick renewal is important when shutting off the steam for a long time means the shutdown of machinery for the same period.

Write for Catalog No. 21 and the name of our nearest distributor.

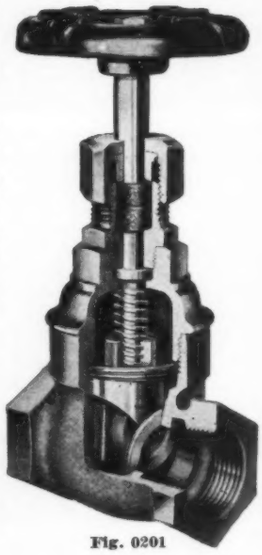


Fig. 0201

THE FAIRBANKS COMPANY
401 Lafayette St., New York, N. Y.

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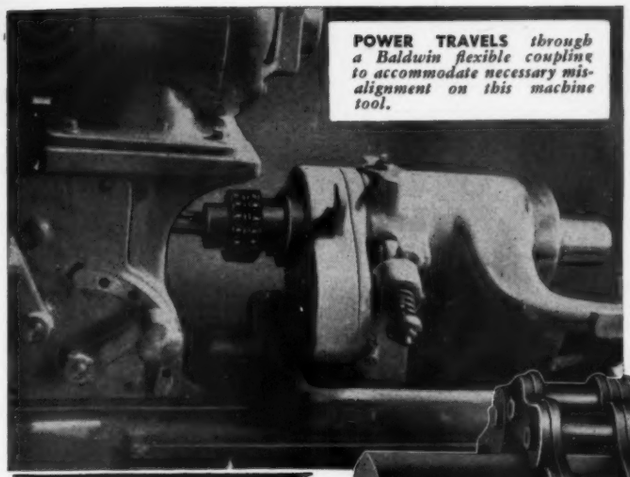
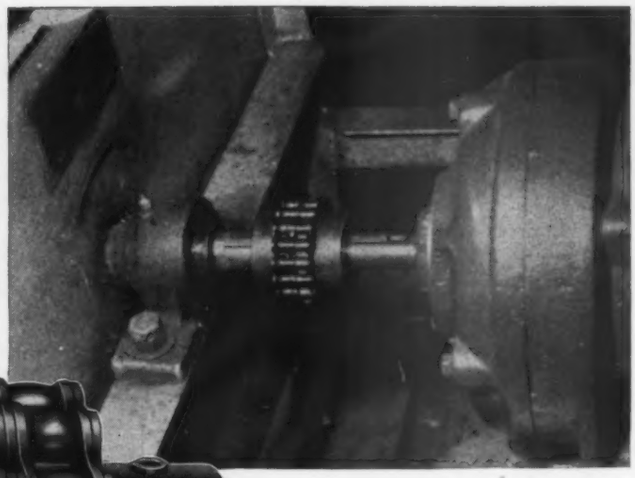
Distributors in Principal Cities
Factories:
Binghamton, N. Y., Rome, Ga.

Fairbanks Renewable Valves



POWER TRAVELS *through a Baldwin flexible coupling to accommodate necessary misalignment on this machine tool.*



ALL IS QUIET *on this blower unit since a Baldwin coupling replaced another whose noise and early wear due to backlash put it on the "black list."*

THERE'S NOT ANOTHER *like it! This patented Baldwin flexible coupling is the only chain belt coupling that's* truly *flexible, yet completely free from backlash!*

Please Note

Whether in relation to a defense problem or a commercial application, your inquiry will receive prompt attention. However, delivery of Baldwin products for the latter must be subordinate to the delivery of orders bearing priority distinction.

Now! True Flexibility

WITHOUT DESTRUCTIVE BACKLASH!

● You may have been using so-called "flexible" couplings for 30 years; you may have legitimate claim to more knowledge of ordinary coupling performance than we have; but if you have, you'll be all the more interested when we say:

"Mister, you haven't seen anything yet!"

By "anything" we mean *any* coupling that can equal the performance of this unique, *truly flexible* Baldwin chain belt coupling.

Here's a coupling that has built-in flexibility—without backlash—it *has* to wear longer! Here's an all-steel chain belt coupling whose cylindrical and barrel-shaped rollers mean *real* flexibility—up to 3° either side of center line.

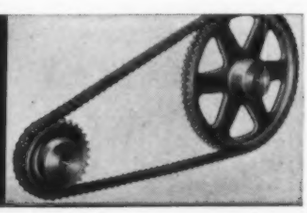
Call the Baldwin man! Try a Baldwin coupling—see if it doesn't run quieter, smoother, accommodate more misalignment and *still* last longer than any you've ever known! Then you'll see why it pays to standardize on Baldwin flexible couplings throughout your plant.

GET THIS BOOK

AND GET THE FACTS!

Here's the whole story about the design and proper application of roller chain belt flexible couplings for all standard and many special requirements. Complete with prices, dimensions, horsepower tables, service factor tables and other useful information, this book contains many valuable hints for anyone responsible for the low-cost, trouble-free operation of plant machinery. Write to the address below, or call the Baldwin man.

BALDWIN
CHAIN BELTS



Please address your inquiry to:

BALDWIN-DUCKWORTH
Division of Chain Belt Company
327 Plainfield St., Springfield, Mass.
Factories at Springfield and Worcester, Mass.

YOUR DISTRIBUTOR stands in with the biggest supply-sources. He's the first and foremost taker of mill supplies. The value of his buying connections — made solid by essential services to the producer — he passes on to you in this emergency.

He goes further afield than his factory suppliers in getting the goods for "MUST" orders. He picks up badly needed items from idle reserves far and near. He rations small but precious surpluses to avert the shortages that mean shut-downs.

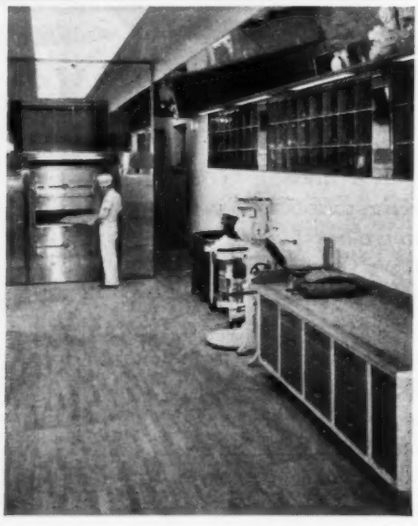
Never was it so urgent for you to make the Distributor *your* Procurement Agent. He gets ALL the hollow screws we make and your own Allen Distributor gets *all we can put through* for you!

THE ALLEN MANUFACTURING COMPANY

HARTFORD, CONNECTICUT, U. S. A.

Today's Trend in Industry is to

Maple Floors



Hard Maple is getting the call today in plants from Coast to Coast.

Why? Because this comfort floor speeds up production, yet may actually cost less.

Warm and dry underfoot, it prevents loss of body warmth through conduction, adds to comfort, protects health. Resilient, it slows up fatigue, while its lasting smoothness speeds up work and traffic, to the benefit of production.

Surprisingly, though, Hard Maple usually costs no more—often, less. So tough-grained, it takes abuse without showing it; often gives many more years of service.

Today, more than ever, industry needs Hard Maple — *for faster production.* Ask your architect about **MFMA** Northern Hard Maple, in strips or blocks. See Sweet's, Sec. 11/88.

MAPLE FLOORING MANUFACTURERS ASSOCIATION

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Floor *with* **MFMA** Maple

REG. U. S. PAT. OFF.

(NORTHERN HARD)

tive vision, and first aid; (2) "The Solution," with chapters describing mechanical guards, process revision, proper lighting, education, administrative supervision.

FOR NATIONAL UNITY— BETTER INDUSTRIAL RELATIONS

Proceedings of the 1941 Silver Bay Industrial Conference. Industrial Service, National Council of the Y. M. C. A.'s, 347 Madison Ave., New York. 132 pages. Photographs. 75c.

Speeches and discussions by men prominent in industry are fully reported, providing a cross-section of industry's thinking on present-day industrial relations problems.

•

ON THE CALENDAR

DECEMBER

1–4, National Fire Protection Association, Chicago. Percy Bugbee, General Manager, 60 Batterymarch St., Boston.

1–5, American Society of Mechanical Engineers, Annual Meeting, New York. C. E. Davies, 29 West 39th St., New York.

1–5, Congress of American Industry, New York. Walter D. Fuller, President, National Association of Manufacturers, 14 West 49th St., New York.

1–6, Exposition of Chemical Industries, Biennial Meeting, New York. Charles F. Roth, Manager, Grand Central Palace, New York.

3–5, National Association of Manufacturers, Annual Meeting, New York. Noel Sargent, Secretary, 14 West 49th St., New York.

4, National Association of Fan Manufacturers, New York. L. O. Monroe, Secretary, 5-208 General Motors Building, Detroit.

4–5, Society for the Advancement of Management, New York. Evelyn Buckley, Secretary, 29 West 39th St., New York.

JANUARY

12–16, Society of Automotive Engineers, Detroit. John A. C. Warner, Secretary and General Manager, 29 West 39th St., New York.

26–30, American Institute of Electrical Engineers, National Convention, New York. H. H. Henline, National Secretary, 33 West 39th St., New York.

26–30, American Society of Heating & Ventilating Engineers, 48th Annual Meeting, Philadelphia. A. V. Hutchinson, Secretary, 51 Madison Ave., New York.

FEBRUARY

4–6, American Management Association, Chicago. Frank F. Gilmore, Conference Planning Manager, 330 West 42nd St., New York.

16–20, National Electrical Manufacturers Association, Chicago. R. J. Blais, Convention Manager, 155 East 44th St., New York.

Insulation Facts · Number 6.

SAVE HEAT WITH EHRET INSULATIONS

Because of its many advantages, Ehret's 85% Magnesia Insulation provides really substantial savings. Economy of plant operation in the form of fuel saved, together with low overall cost per year of the insulation itself, add up to savings that appeal to the users of this time-tested insulating material.

In addition to 85% Magnesia, the Ehret Company provides a full line of industrial insulations. There is an Ehret Contractor or Distributor in every principal city.

EHRET MAGNESIA MANUFACTURING CO.
VALLEY FORGE · PENNSYLVANIA

MAKERS OF INDUSTRIAL INSULATIONS FOR MORE THAN 40 YEARS

Today, Almost Without Exception, Every Motor is a Good Motor—

SUPER PROTECTION

But SUPER PROTECTION Gives Added Value to HOWELL Motors—and Here's Why!

1. SUPER PROTECTION against accidental abuse—*motor frame and base non-breakable.*

2. SUPER PROTECTION against dripping liquids and falling particles—*air openings covered top and sides—no working part exposed*

3. SUPER PROTECTION against winding failures—*windings heavily insulated, using covered enamel wire triple-treated with moisture-proof insulating varnish.*

4. SUPER PROTECTION against destructive vibration—*rotors dynamically balanced to close limits—completed motors precision tested.* And all this is now yours as *standard motor construction.* Write for Bulletin RS-60.

HOWELL ELECTRIC MOTORS COMPANY
HOWELL, MICHIGAN · · · *Representatives in All Principal Cities*

CUTS WASTE MOTION!

Steps up production!

CASE STUDY IN PRODUCTION CONTROL

Simplified paper control system eliminates over 20 forms . . . increases productive time . . . saves thousands of dollars annually for bearing manufacturer—with the help of the Mimeograph duplicator!

A paper control system — adequate for normal times — just wasn't good enough, when defense-time orders began to crowd the plant of a large Ohio manufacturer of bearings, bushings and washers for the aircraft and automotive industries.

So he changed the system — helped by the Mimeograph duplicator and the advice of our company's duplicating experts —and stepped up production substantially.

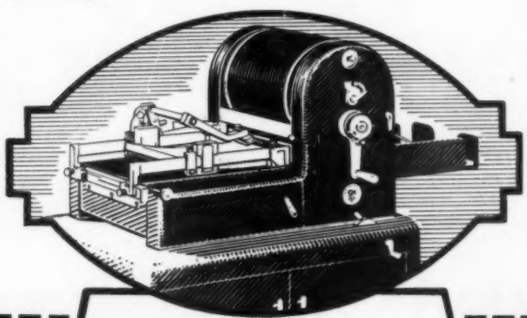
Waste motion was cut by eliminating old-fashioned "route sheets." Previously, employees had to leave machines, go to production centers and tool cribs to get information they needed. Now "travel cards" bring condensations of pertinent facts to the employee at his machine, increase his productive time because the cards are right on the "tote boxes" carrying parts in various stages of manufacture.

Actually, more than a score of different forms were eliminated —and out with them went wasteful, multiple-writing time. Standardizing on a "one-writing" system meant savings in forms alone of thousands of dollars a year, plus the timesaving by the elimination of useless rewriting.

The beauty of it is: Mimeograph equipment installed in this plant paid for itself in less than two months.

This case is just one example of the way Mimeograph duplicators work for and with manufacturers to cut the cost of production control. For an analysis of your paper work problems and moneysaving recommendations, call the Mimeograph distributor in your community—or write A. B. Dick Company, Chicago.

". . . cards right on the 'tote boxes.'"



Mimeograph duplicator

Mimeograph is the trade-mark of A. B. Dick Company, Chicago, registered in the U. S. Patent Office.

FREE! Results of our work with hundreds of companies mean practical suggestions and usable ideas for your company! Send for your free copy of remarkable new portfolio, ***Manufacturing Profits.*** Clip the coupon today!

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720 W. Jackson Blvd., Chicago, Ill.
Rush me a free copy of ***Manufacturing Profits.***

NAME..... *TITLE*.....

COMPANY..... *STREET*.....

CITY..... *STATE*.....

Do something! -call Scully!

IF you're in a jam for steel, give us a ring. We can't, under present conditions, promise you *all* you need, but you'll get a quick, courteous answer—and prompt delivery of what we have. Every one of our eight warehouses is working night and day to maintain the kind of service that has made the Scully name famous. If you need steel, steel products, copper, brass, tools, equipment or machinery, write, wire or phone the nearest Scully warehouse. We'll cooperate to the best of our ability. If you don't have a copy of our handy Stock List & Reference Book, ask for one—it's free.

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Distributors of Steel, Steel Products, Copper and Brass

Warehouses at CHICAGO
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The Mark of Quality →

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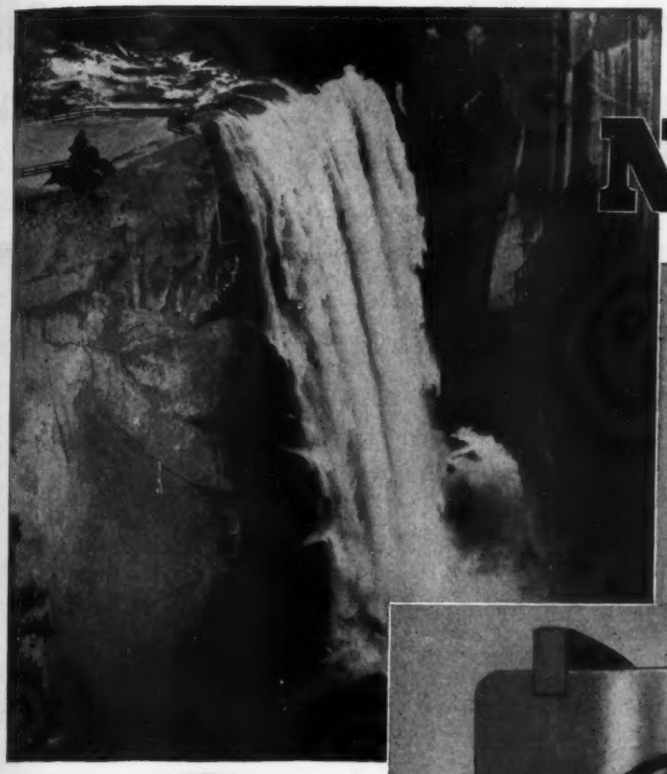
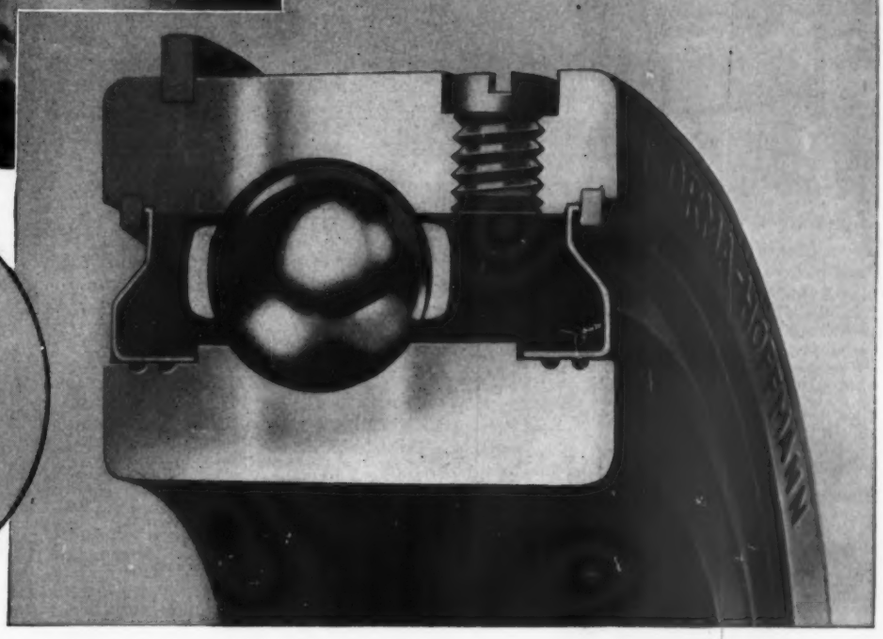
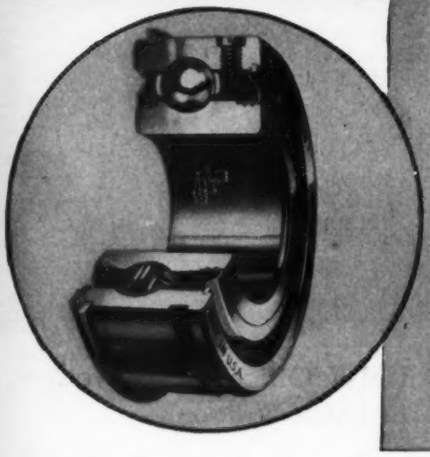
UNITED STATES STEEL



NO *Fear of* GOING DRY!





What water means to the earth, lubricant means to a bearing — life itself. And as the mountain stream provides an abundant and constant flow of water, so the exceedingly large grease capacity of the "CARTRIDGE" BALL BEARING provides constant and abundant lubrication to its raceways and rotating elements.

In the cross-section herewith, note how the DOUBLE-ROW WIDTH GIVES THE "CARTRIDGE" BEARING DOUBLE THE GREASE CAPACITY of the single-row type — guarding against premature dryness. Note also how the in-built metal seals confine the grease WITHIN THE BEARING ITSELF, REGARDLESS OF THE ANGLE OF THE SHAFT.

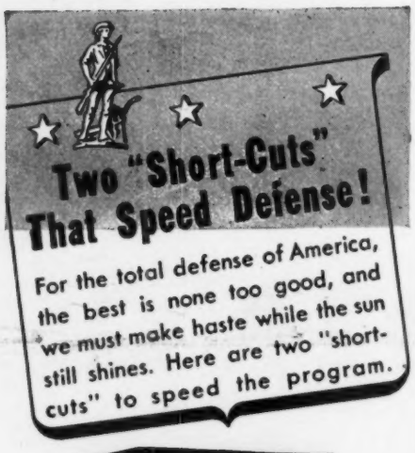
The "CARTRIDGE" BALL BEARING is equipped with close-fitting, wearless metal shields which, with recessed inner ring construction and two or more grease grooves, form a truly effective labyrinth through which THE GREASE CANNOT PASS AND DIRT CANNOT ENTER.

Adopt the "CARTRIDGE BALL BEARING as your insurance against neglected lubrication, and dirt and grease contamination. It is handled as an integrally sealed unit, needing no supplementary closure parts. It provides easier and quicker assembly and disassembly. It STAYS CLEAN before mounting, during assembly, or when removed, and has convenient regreasing and inspection features.

Write for the Catalog. Let our engineers work with you.

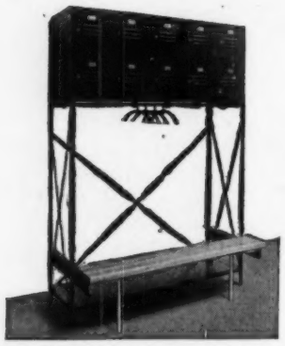
NORMA-HOFFMANN BEARINGS CORP'N., STAMFORD, CONN., U.S.A. • FOUNDED 1911

PRECISION BALL, ROLLER and THRUST BEARINGS


Two "Short-Cuts"
That Speed Defense!
For the total defense of America, the best is none too good, and we must make haste while the sun still shines. Here are two "short-cuts" to speed the program.

PENCO "3-Shift" Tool Stand
All-welded Steel Construction

Keep tools right on the job twenty-four hours a day. Each of the three drawers locks separately—a single drawer for each shift. Cuts tool losses. Amazing time-saver!



Penn-Kelsey Wardrobe-Locker
60" Wide — Accommodations for 10

Occupies half the floor space ordinarily required. This extra floor space can be used for productive purposes.

Ten private, locked compartments, wooden seat and perforated metal shoe rack. Minimum initial cost per person.

Write for details and prices.

1869 Penco

Penn Metal Corporation of Penna.

In Business Continuously Since 1869

26 Oregon Avenue, Philadelphia, Pa.

THEY SAY AND DO

Wage Increases Exceed Cost of Living Rise

In the 1941 price spiral, wage increases have kept well ahead of living costs. This is shown in a statement that was recently released by the National Association of Manufacturers.

In the nine months starting last January 1, living costs have gone up 5.6 percent while average hourly earnings have risen 11.3 percent, the report pointed out. The result is a net 5.3 advance in the purchasing power of average hourly earnings.

"It is, of course, a possibility that the situation may be altered by future rises in the cost of living and that wage adjustments may be demanded in anticipation of higher prices," the NAM said. "But the race between wages and prices seems somewhat futile since it inevitably leads to the familiar spiral of inflation where prices rise in response to higher wage costs and wages in turn are advanced because of higher prices."

•

Closed Shop Studied in New Survey

Closed shop or union shop conditions prevail in the labor agreements covering about one-third of the unionized workers in 10 of the nation's leading industries, the Twentieth Century Fund reports in a timely survey of the union shop issue.

Definitions of the differing types of representation agreement are clearly drawn in this study in which research workers of the Twentieth Century Fund were engaged for two years. The report points out that it is important to keep in mind the distinctions between various forms of union status. These are defined as follows:

1. Closed shop—only union members can be hired and workers must remain union members to retain employment.

2. Union shop—non-members may be hired, but to retain employment, must become union members after a certain period.

3. Preferential shop—union members are given preference in hiring or lay-off, or both.

4. Maintenance of membership shop—no one is forced to join union but all present or future members must remain in good standing as a condition of employment.

5. Exclusive bargaining shop — the union is recognized as the exclusive bargaining agent for all employees, whether union members or not.

6. Bargaining for members only—the union is recognized as the bargaining agent only for its own members.

The report demonstrates that industries long accustomed to collective bargaining are those in which the more rigid types of union status are likely to prevail. The survey covers 10 industries employing 6,000,000 workers, some 4,000,000 of whom are union members. The closed shop does not completely prevail in any industry, but is dominant in printing, clothing, boots and shoes, and construction.

"The union shop prevails in coal mining while exclusive bargaining rights are prevalent in the five remaining big industries covered by the survey. They are: automobiles, rubber, electrical manufacturing, iron and steel, and railroads," the report points out. "Most unions seek closed, union, or preferential shops, chiefly to strengthen the organization, prevent discrimination, aid in enforcement of standards, and gain greater control over their membership. They hold that since all employees share benefits won by collective bargaining, all should contribute. They also hold that closed shops make unions more responsible bargaining agents, eliminate friction between union and non-union employees, and protect both employers and recognized unions against rival unions.

"Employers opposed to closed and union shops maintain that their choice of workers is limited and that they are required to discharge those who have resigned or have been expelled from unions, yet whose work has been satisfactory. They further claim that some of their workers do not wish to join unions; and that since employers are forbidden by law to prevent their workers, from joining unions, they should not be forced to compel workers to do so. Some employers hold that closed shops are, in effect, monopolies, whereas they themselves are forbidden by anti-trust laws to engage in monopolistic practices."

•

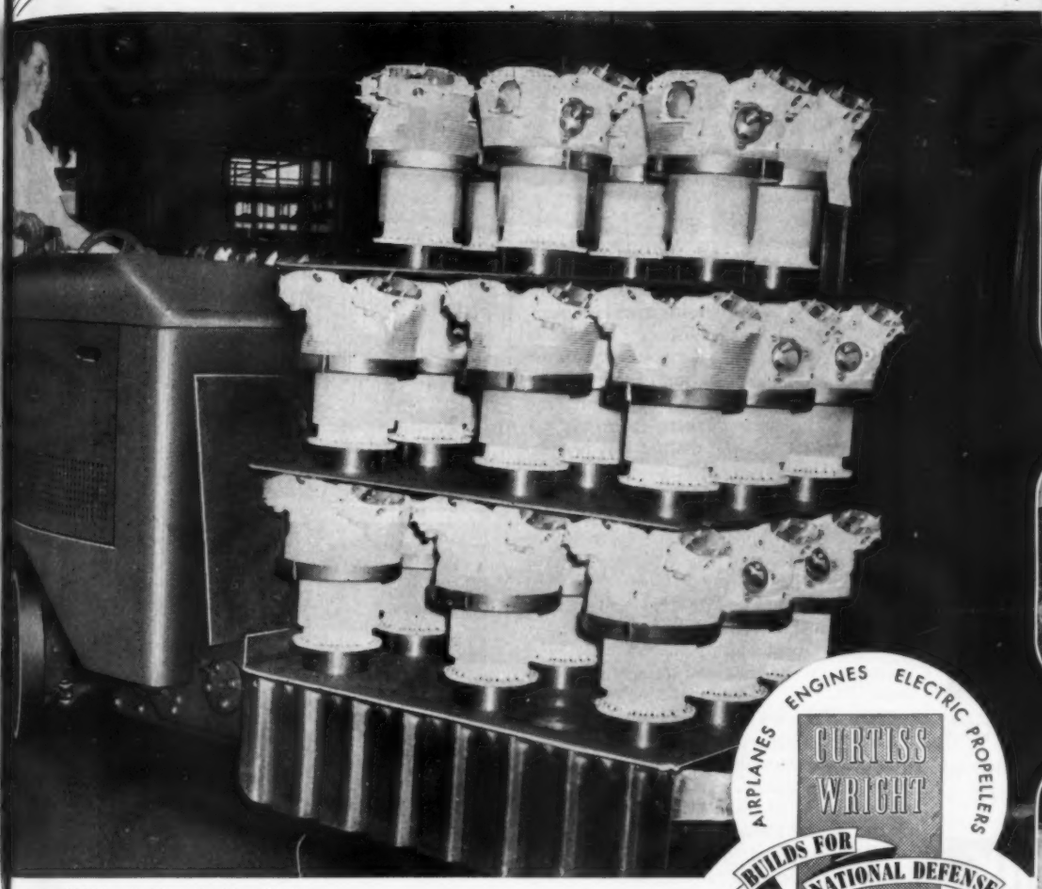
UMW Officers Removed in Dues Strike

The 22,000 Pennsylvania hard coal miners who struck against their own union, the United Mine Workers, last September, are no longer governed by the district union officers whose policies they protested.

The strange, little-known strike (described in "Revolt in the CIO," in FACTORY for October) lasted but five weeks and was soon eclipsed by the widely-publicized UMW strike in the "captive" mines.

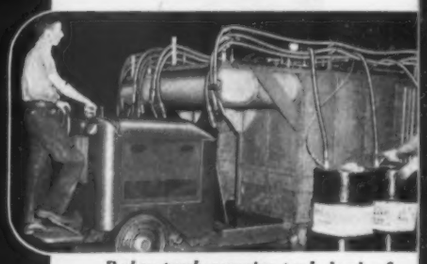
Background: In the Panther Creek Valley section of Pennsylvania, which is District Number 7 of the UMW, the union's dues were raised to a figure 50 cents a month higher than those charged in other districts. This was in addition to a new general assessment affecting members in every district. The dues were collected, under a closed shop agreement, by the check-off method. When the new dues went into effect in District 7, a small group of miners led by Garrett Miller of Nesquehoning, Pa., began the strike—directed not at the mine owners but at the UMW and its international president,

How BAKER TRUCKS help Curtiss-Wright "build for National Defense"



Skid-load of 24 double cylinders for Wright engines handled easily by Baker Low-Lift Truck.

Baker Tractor pulling 4-trailer train at Buffalo Curtiss-Wright plant.



Baker truck carrying tank-loads of cutting oil for machining operations.

Baker Truck carrying crankcases for Wright engines to the assembly department at Paterson plant.

Baker Truck carrying skid-load of 4 oil drums into Paterson plant.

Baker Hy-Lift Truck unloading Allison engines in cartons weighing 2100 lbs. at Buffalo plant.

Baker Hy-Lift Truck lifting unwieldy pre-fabricated box top for shipping Curtiss fighter.

AIRPLANES ENGINES ELECTRIC PROPELLERS
CURTISS WRIGHT
BUILDS FOR NATIONAL DEFENSE
Curtiss WRIGHT

To achieve peak efficiency in its huge plants, Curtiss-Wright uses fleets of Baker Trucks for a wide variety of handling operations. A few of these are illustrated here... Mechanization of material handling is making it possible for hundreds of plants producing vital war equipment greatly to increase plant capacity without adding to floor space or man-power. Baker Trucks are thus playing a vital role in the Defense Program.

BAKER INDUSTRIAL TRUCK DIVISION
of the Baker-Raulang Company
2178 WEST 25th STREET • • CLEVELAND, OHIO

Trade mark Registered U. S. Pat. Off.

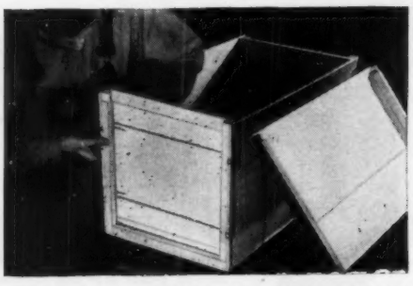
Baker INDUSTRIAL TRUCKS

in Canada: Railway and Power Engineering Corporation, Ltd.

General ALL-BOUNDS *make* DEFENSE PRODUCTS **MOVE FASTER**

Eliminating lost motion . . . saving floor space . . . providing easier, faster handling . . . the General All-Bound Box is helping scores of manufacturers maintain production line speed in their shipping rooms.

The General All-Bound is shipped flat, yet two-thirds assembled — even inexperienced workmen can complete assembly in record time. No nails are necessary, can be closed and securely sealed simply by bending sturdy wire loops.



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General All-Bounds are used for nearly all types of products in shipments up to 500 lbs.

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Address .....

City ..... *State* .....

John L. Lewis—which quickly spread until it involved all the 22,000 workers in the district.

When Lewis went personally to Hazleton, Pa., District 7's central city, to plead with the miners to return to work, they at first refused. Much of their protest arose from the alleged wasteful practices of the District's union officers, chief of whom was Hugh V. Brown, president.

In a FACTORY interview, Miller explained the strikers' stand. He said that under the original check-off agreement, the workers had been pledged to pay only $14 a year for dues and assessments. The increases combined to raise the total amount assessed to $24.

"We agreed to pay the $14—and no more," Miller said. "We'll pay that any time. But we won't pay $24. If the union can take $10 away from us without our say-so today, it can take $50, $100, $1,000, or all we've got tomorrow."

Miller and the other insurgent leaders also charged that District President Brown had failed to make good a promise of economy in the operation of the district office and that the payroll of union employees had increased there from five to 26 at a time when the district was heavily in debt to the international.

When the men finally agreed to go back to work, it was upon Lewis's promise to investigate their grievances thoroughly and to accede to their demand for removal of the district officers. Shortly after, he suspended President Brown and his staff, installing Martin F. Brennan as temporary president. No definite announcement of further action has been made.

While Lewis's action appeared to most observers to represent an important compromise in favor of the insurgent miners, it was condemned as "dictatorial" by the *New Leader*, of New York, a labor paper of the Social Democratic Federation.

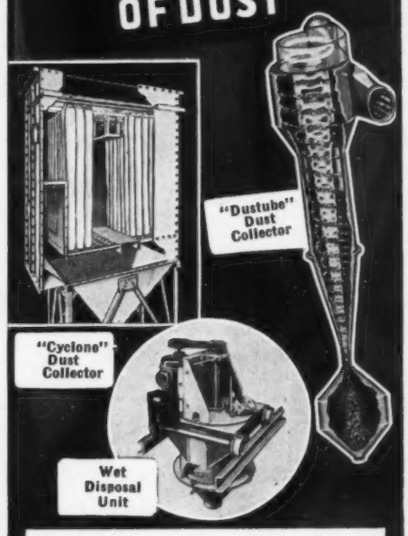
"Having called off the strike in the belief that they would be permitted to hold an election and determine their district affairs as they saw fit, in accordance with the constitution of the United Mine Workers, the miners now discover that Lewis, like Stalin, does not forget," the *New Leader* commented. "Lewis suspended his own henchmen in District 7, including President Hugh V. Brown and his associates, to enable him to institute a receivership under Martin F. Brennan.

"The time and circumstances of any election in District 7 will be determined by Fuehrer Lewis. We may be sure it will be preceded by such purges as he may first see fit to execute. Preparations for the purges have already begun with the appointment of a commission of inquiry. Ostensibly the commission's duty is to investigate the causes of dissatisfaction prevalent in District 7. Actually it will seek to ferret out the insurgents who dared to challenge the wisdom of the dictator of the United Mine Workers, whose ambition it is to extend his totalitarian empire to the whole of American labor and through it to the United States.

"We predict Lewis will fail. He is fighting a losing battle not only in the labor movement but in his own union. Organized labor has taken his measure

IT'S HERE

THE ADVANTAGE OF DRY DUST COLLECTION *plus* WET DISPOSAL OF DUST



GONE is the danger of dispersing dust into the atmosphere, upon emptying the hopper of a dry type dust collector, because the American Wet Disposal Unit makes a wet sludge instantly of all dust that is released. The unit can be mounted on a track and moved from one hopper to another.

The combined use of the Wet Disposal Unit and either an American "Dustube" or High Efficiency "Cyclone" Dust Collector provides a set-up that is the peak in collecting and operating efficiency.

"Dustube" efficiency exceeds 98% by weight. The Cyclone, while slightly less efficient than the "Dustube" is, nevertheless, the equal of the average wet system.

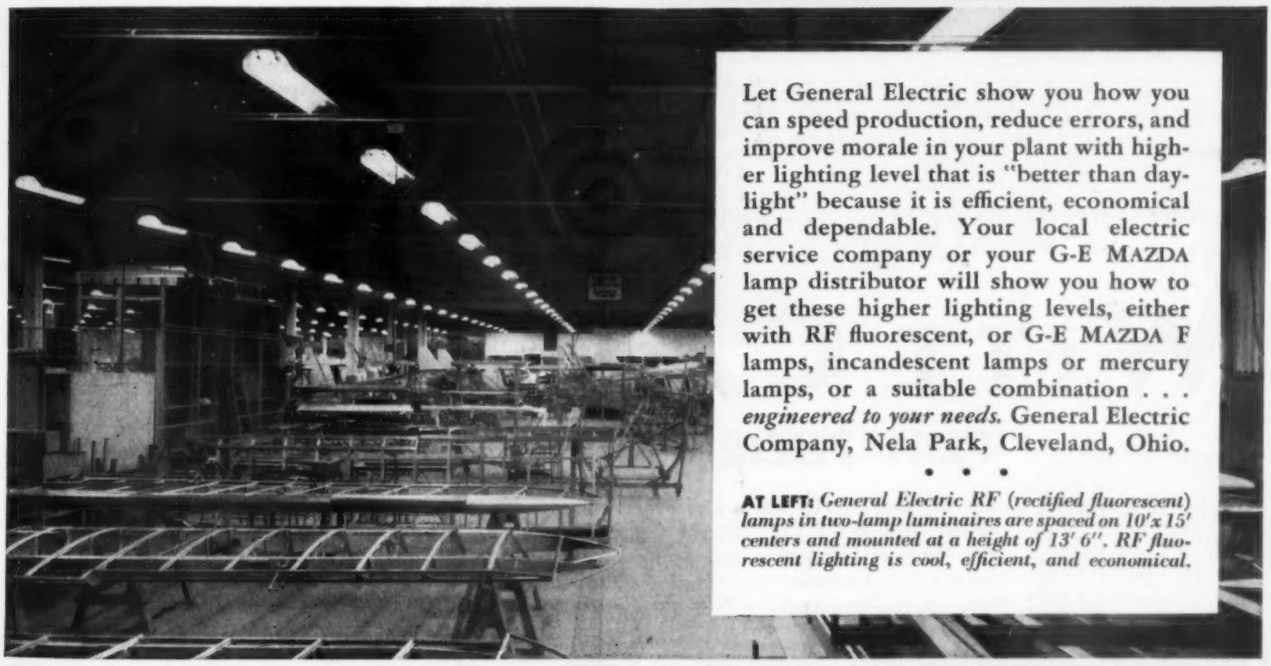
Why not prove these statements by actual tests on your own dust? Write for literature.

AMERICAN FOUNDRY EQUIPMENT CO.
374 S. BYRKIT ST. MISHAWAKA, IND.

SEE HOW CLEARLY GENERAL ELECTRIC RF FLUORESCENT LIGHTING HELPS YOU READ THIS SCALE . . .

AT the Stinson Aircraft Company's Wayne, Mich., plant, General Electric's RF (rectified fluorescent) lamps provide 30 footcandles of "indoor daylight" to speed defense work. In this unretouched photo of the cross-feed dial on a typical lathe, note how clearly RF lighting reveals the markings, making them easy to read quickly and accurately.

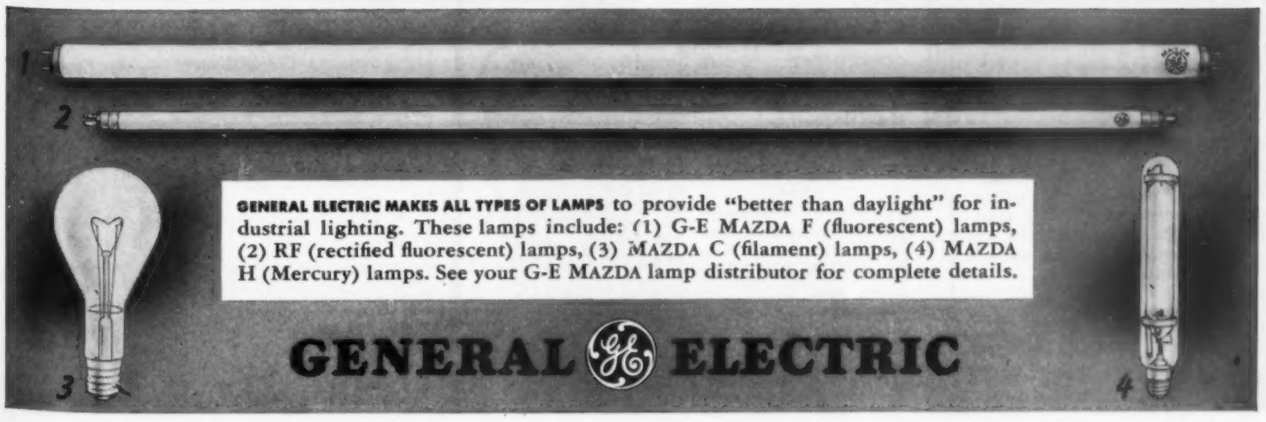
The illustration below shows how this lighting produces little shadow and brings out every detail of the plane, including fuselage and wing construction.



Let General Electric show you how you can speed production, reduce errors, and improve morale in your plant with higher lighting level that is "better than daylight" because it is efficient, economical and dependable. Your local electric service company or your G-E MAZDA lamp distributor will show you how to get these higher lighting levels, either with RF fluorescent, or G-E MAZDA F lamps, incandescent lamps or mercury lamps, or a suitable combination . . . *engineered to your needs.* General Electric Company, Nela Park, Cleveland, Ohio.

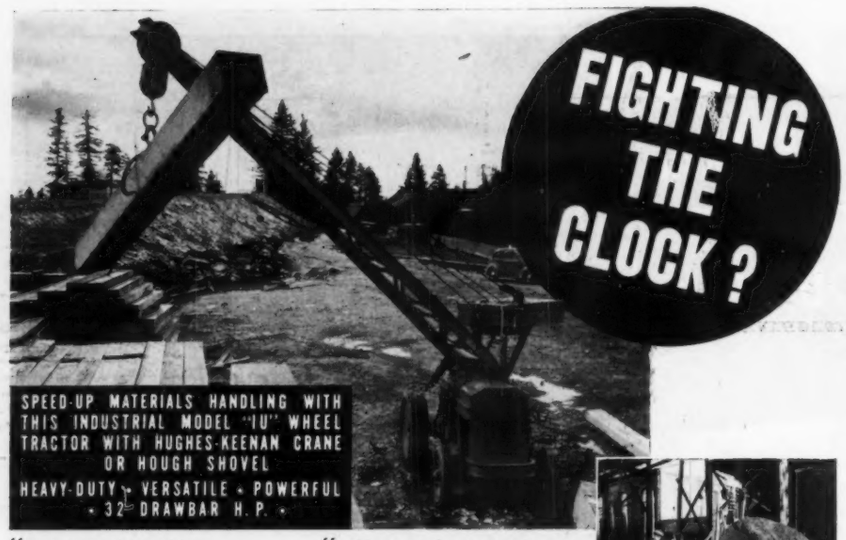
• • •

AT LEFT: *General Electric RF (rectified fluorescent) lamps in two-lamp luminaires are spaced on 10′ x 15′ centers and mounted at a height of 13′ 6″. RF fluorescent lighting is cool, efficient, and economical.*



GENERAL ELECTRIC MAKES ALL TYPES OF LAMPS to provide "better than daylight" for industrial lighting. These lamps include: (1) G-E MAZDA F (fluorescent) lamps, (2) RF (rectified fluorescent) lamps, (3) MAZDA C (filament) lamps, (4) MAZDA H (Mercury) lamps. See your G-E MAZDA lamp distributor for complete details.

GENERAL ELECTRIC

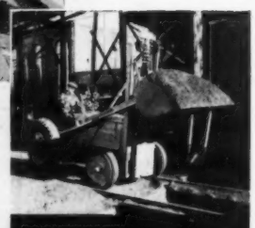

FIGHTING THE CLOCK ?
SPEED-UP MATERIALS HANDLING WITH THIS INDUSTRIAL MODEL "IU" WHEEL TRACTOR WITH HUGHES-KEENAN CRANE OR HOUGH SHOVEL
HEAVY-DUTY • VERSATILE • POWERFUL • 32 DRAWBAR H.P. •

"IU" WITH CRANE—

Handles loads up to 4,000 pounds. Full revolving. Boom lengths—12', 15', 18', 21' others to order. Power operated. Small enough to enter through doorways. Nigger head or drum available to snake loads within reach of boom—extends your operations to untravelable areas.

"IU" WITH SHOVEL—

Loads or unloads coal, fertilizer, sand, stone, gravel, ashes, snow—any bulk material. Easily loads into trucks. Bucket may be tripped at any height from ground—up to 7'3". Works in smallest places—where big shovels cannot go.



Write for descriptive literature. See your Allis-Chalmers dealer.

For lighter loads—up to 1,800 pounds—we recommend the Model IB tractor with crane.

ALLIS-CHALMERS POWER

TRACTOR DIVISION · MILWAUKEE · U. S. A. TRACTORS, ENGINES, ROAD MACHINERY

IT DOESN'T COST .. *it Pays!*

Safety First

WITT CANS

PLAY THEIR PART

For disposal of oily waste and other inflammable refuse, use WITT Oily Waste Cans. They bear the label of inspection and approval of Underwriters Laboratories, Inc. and Factory Mutual Insurance Companies.

WITT Cans and Pails are sturdily constructed from special analysis steel insuring longer life.

Proved from 50% to over 400% stronger in tests at Pittsburgh Testing Laboratory.

Foot operated or hand operated covers. Plain or corrugated bodies —7 sizes.

THE WITT CORNICE COMPANY
WINCHELL ST. CINCINNATI, OHIO

and he will go the way of all adventurers who have sought to make the labor movement an obedient vehicle for the satisfaction of their pathological egos."

One decisive factor affecting the insurgent strike was settled after the strike was ended when Lewis G. Hines, Pennsylvania Secretary of Labor, ruled that 15,000 of the strikers were entitled to unemployment compensation benefits. Hines based his findings on the fact that many of the mine owners had refused the request of the strikers to refrain from collecting the added dues and assessments in the check-off. For this reason, Hines said, the dispute was not merely one between the workers and the unions but a strike involving the employers.

"This action put the operators squarely into the problem and thus it becomes an industrial dispute," Hines said. He then authorized the payment of the benefits, ranging from $7.50 to $15 a week depending on the amount of wages earned.

•

New Committee Rallies Economy Advocates

A coordinating force to fuse public opinion in a national drive for reduction of non-defense federal expenditures has been forged by the newly organized Citizens Emergency Committee on Non-Defense Expenditures.

This group, headed by Henry M. Wriston, president of Brown University, has given wide circulation to a pledge which other organizations are being asked to sign. In part, the pledge points out that "to afford defense and at the same time to insure a stable America in the future, all non-defense non-essentials of government must be cut to the limit." It acknowledges that "in the past, many individuals and organizations, while demanding economies of their Congressmen, have at the same time brought pressure to bear on those Congressmen to push local projects and expenditures that were not truly vital to the community."

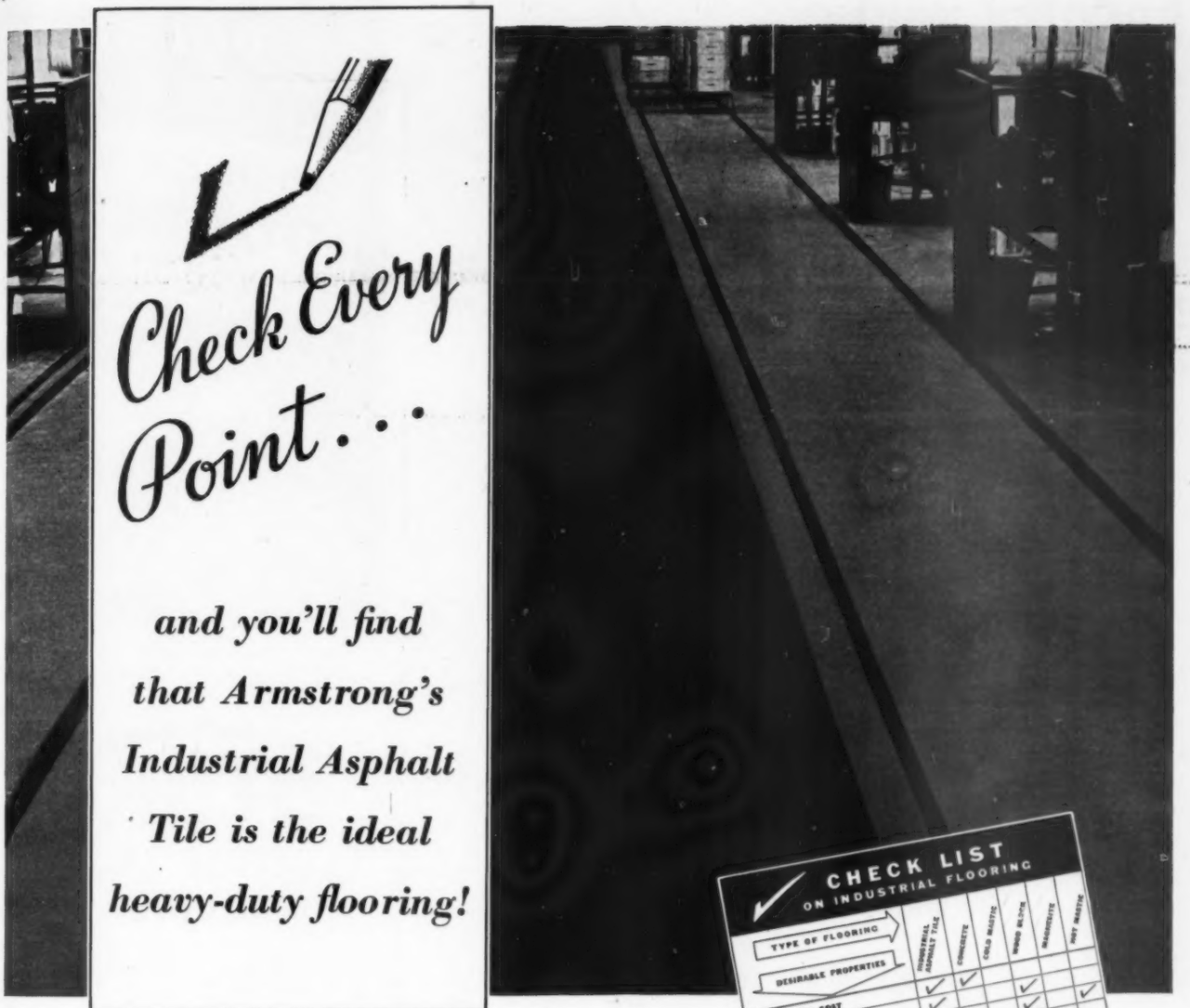
For this reason, organizations which sign the pledge agree "in this emergency to serve the interests of our country by not asking of any public official any expenditure which can be deferred or which we do not truly believe to be now essential either to defense or to our own legitimate welfare or to that of our state or community." The pledges are addressed to the President and the Congress of the United States and are transmitted to them by the Committee.

•

U. S. Public Approves Price-Wage Control

The American people are quite ready to accept drastic control of prices and wages, along Canadian lines, if the findings of George Gallup, Director of the American Institute of Public Opinion, are correct.

The question came up and was presented to a representative segment of the American public following the recent adop-



Check Every Point . . .

and you'll find that Armstrong's Industrial Asphalt Tile is the ideal heavy-duty flooring!

CHECK LIST ON INDUSTRIAL FLOORING

TYPE OF FLOORING / DESIRABLE PROPERTIES	INDUSTRIAL ASPHALT TILE	CONCRETE	COLD MASTIC	WOOD BLOCK	MAGNESITE	HOT MASTIC
LOW INITIAL COST	✓	✓		✓		✓
FAST INSTALLATION	✓			✓		
READY TO USE AS SOON AS LAID	✓				✓	
LOW MAINTENANCE COST	✓	✓	✓			✓
HIGH TENSILE STRENGTH	✓	✓		✓	✓	✓
TOUGH	✓		✓	✓	✓	✓
RESISTANT TO DENTING	✓			✓	✓	✓
NON-DUSTING	✓					✓
NON-SPALLING	✓		✓			✓
NON-SPARKING	✓		✓		✓	
SELF-HEALING	✓	✓			✓	
NOT DAMP	✓		✓			✓
FAST TRUCKING	✓		✓			✓
NON-SLIP	✓		✓			
RESTFUL, RESILIENT	✓					
QUIET	✓			✓	✓	✓
PLEASING APPEARANCE	✓	✓	✓		✓	✓
ODORLESS	✓	✓	✓			
VERMINPROOF	✓					
LIGHT WEIGHT	✓					

HERE'S a new *extra-service* factory and warehouse flooring—one that was developed primarily to meet today's industrial demands. Armstrong's Industrial Asphalt Tile, *made by a flooring manufacturer,* combines in one material a long list of desirable features no other industrial flooring can match!

This tough, reinforced mastic in tile form is low in first cost, quick and inexpensive to install, and it's ready for use as soon as laid! It's a *safe* floor, too! Armstrong's Industrial Asphalt Tile is nonslip even when wet, nonsparking, splinterproof, and dampproof. The glare-free surface is smooth for easy cleaning, fast trucking, and easy steering—yet it provides ample traction for safety on ramps.

You can count on low-cost maintenance and lasting service when this floor is installed. It combines *light weight* with unusual resistance to indentation from both live and dead loads, and to abrasive wear. It won't chip, crack, dust, or spall, even under the constant punishment of heavy trucking. Armstrong's Industrial Asphalt Tile actually *improves* with wear. Individual blocks are easily replaced in the event of serious damage.

Before you floor or refloor, consider carefully *all* the advantages of Armstrong's Industrial Asphalt Tile shown in the check list on the right. Compare these features point by point with *any* other industrial flooring materials in use today. A test of this kind will prove at a glance that Armstrong's Industrial Asphalt Tile is the wise choice for *your* modern plant. For an interesting folder and complete information, clip the coupon to your letterhead and mail today to Armstrong Cork Company, Resilient Tile Floors Department, 1242 State Street, Lancaster, Pennsylvania.

ARMSTRONG'S FLOORS
INDUSTRIAL ASPHALT TILE

ARMSTRONG CORK COMPANY
Resilient Tile Floors Department
1242 State Street
Lancaster, Pa.

Gentlemen:

Without obligation, please send me my copy of the new informative booklet on industrial flooring.

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Address.....

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TYPE "SH" UNIT HEATER
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Don't let cold, drafty, unhealthy temperatures reduce the efficiency of your workmen. It costs less to maintain healthful winter temperatures in factory, office or warehouse with YOUNG High Efficiency heaters. These practical units are made in many different types and sizes to fit the heating needs of any installation. Write for catalogs giving complete information and technical data.

VERTIFLOW UNIT HEATER
Catalog No. 2541

TYPE "FH" UNIT HEATER
Catalog No. 336

YOUNG RADIATOR COMPANY
Dept. 121-N, Racine, Wisconsin

Young High Efficiency
HEATING COOLING AND AIR CONDITIONING UNITS

tion by the Canadian government of a price "ceiling" coupled with an order "freezing" wages at their present levels (but providing a cost-of-living bonus in the event that price-fixing fails).

This is the question which Gallup put to the Americans who answer questions in his samplings of public opinion:

"A new law in Canada keeps prices from going higher than they are now and also keeps wages and salary rates from going higher. Would you approve or disapprove of such a law in the United States?"

Of those responding, 67 percent said they would approve, 24 percent indicated disapproval, and only 5 percent were undecided.

"As one way to prevent prices from going up rapidly, would you be willing to have the government keep your wage (salary) rate where it is now, if the government also keeps the prices of the things you buy where they are now?"

To this 66 percent said "Yes", 28 percent said "No" and 5 percent declared themselves undecided.

If the Gallup report is accurate, Congress has lagged far behind public opinion in its deliberate debate of the price control bill before it. The bill contains no wage control features. This has caused critics of its policy to contend that the measure was more likely to accelerate price inflation than to induce price control—especially since the price parity guaranteed to farmers puts no check on agricultural prices which are left free to rise if wages and the prices of manufactured goods continue to climb.

•

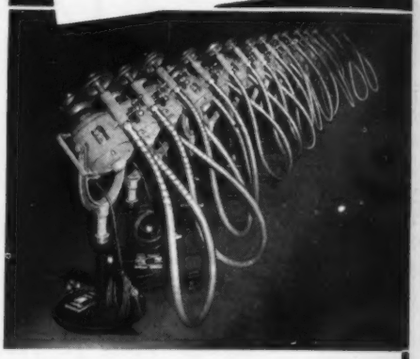
NAM Urges Program for Labor Peace

Amid the clamor of defense strikes, the National Association of Manufacturers recently set forth a seven-point program for national labor policy. It follows:

1. There must be no government compromise with a challenge by a private agency to the sovereignty of government.
2. The right to strike, like other rights, is subject to reasonable regulation in the public interest. Without such regulation, the right to strike will destroy the equally valid right to work.
3. A sound national labor policy which will require unions to acquire and retain members on the basis of their service to such members and not through the blackmailing of either management or government into forcing a closed shop upon employees who do not wish to join.
4. A sound national labor policy will require unions to settle their jurisdictional agreements without halting production.
5. The seizure of private property by government is an unsound means of controlling unions which strike against the public interest.
6. Civil law and not martial law should be the normal method of enforcement of safeguards against coercion.
7. A sound national labor policy, resulting from the present crisis, should be a permanent one and should not be limited in duration to the present emergency.

WE'VE DOUBLED OUR PRODUCTION

TO HELP YOU DOUBLE YOURS!



Part of a battery of Stow machines ready for shipment for big defense operation.

STOW
FLEXIBLE SHAFT MACHINES

Whether it's men or machine tools, working under pressure soon shows if they've got the "guts" to take it. That's why hundreds of shops working on National Defense orders are turning to Stow Flexible Shaft Machines. Every day, these sturdy, many-purpose machines are meeting the test—turning out more work in a full day's schedule—helping to get rush-production done on time!

There's good reason for this *unfailing dependability*. Stow—the inventors of the flexible shaft—have been in business over 66 years. So, with Stow, you'll benefit from the most extensive flexible shaft experience in America. Let the name Stow be your guide in buying flexible shaft machines. It pays! Write for complete catalog NOW!

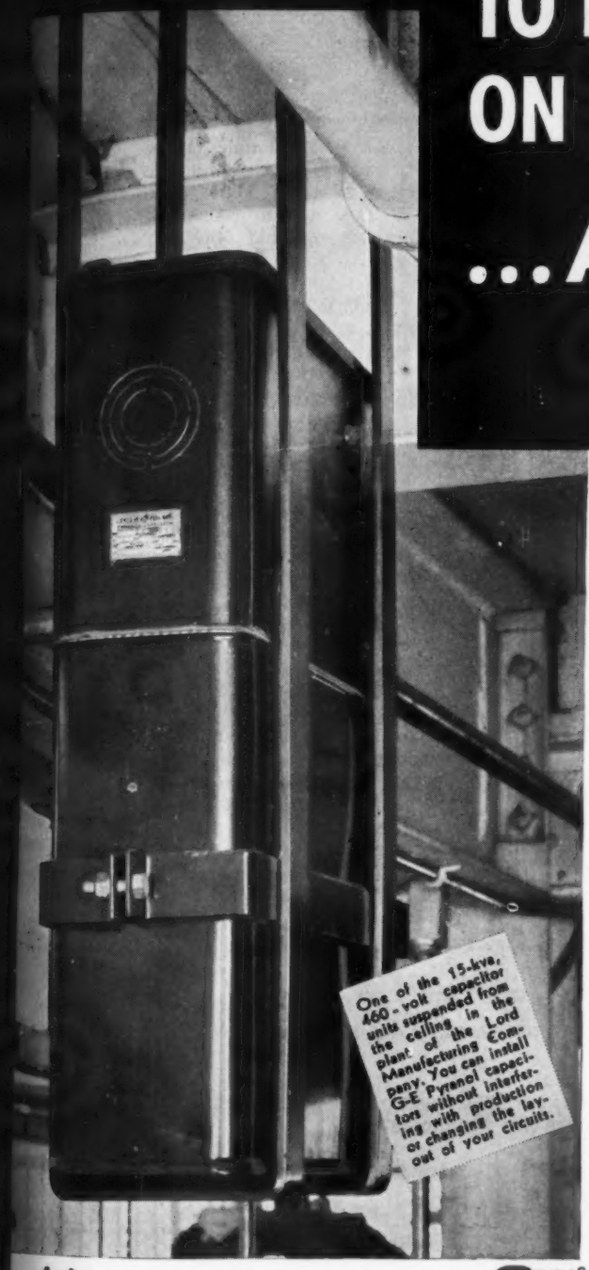
STOW MFG. CO., Inc.
3 Shear St. Binghamton, N. Y.
Established 1875
Inventors of Flexible Shafts

★ PROMPT DELIVERIES
Due to greatly expanded plant facilities, we can make deliveries on any of our 14 standard-model, heavy-duty machines within 2 to 5 days from receipt of order!

QUICKEST WAY

TO PROVIDE FOR MORE LOAD ON YOUR POWER CIRCUITS

...AT LOWEST COST, TOO!



One of the 15-kva, 460-volt capacitor units suspended from the ceiling in the plant of the Lord Manufacturing Company. You can install G-E Pyranol capacitors without interfering with production or changing the layout of your circuits.

DO YOU want to add more induction motors in your plant without installing additional generating equipment, transformers, switchgear, or feeders? Then investigate G-E Pyranol* capacitors. By neutralizing reactive kva, capacitors enable your circuits to carry more working current for additional motors and other equipment. The capacitors can be installed without interfering with production and they cost much less than other methods of providing additional capacity.

How Capacitors Released Capacity for One Industrial Plant

When the Lord Manufacturing Company, Erie, Pa., needed more power for production, a study showed that capacitors would release the additional capacity required. Capacitors totaling 80 kva were installed in various feeders in the plant, and power-factor was raised from 55 to 80 per cent. Here are the results:

1. The losses were reduced and voltage was improved—the line current was lowered from 168 to 129 amperes.

2. The generator output was increased from 75 to 85 kw.

Extra Savings

In addition to releasing capacity in your plant, capacitors will reduce your power cost if your power contract contains a power-factor or kva demand clause. These savings may pay for the capacitors in one to three years, and then the savings will continue—so it's a highly profitable investment.

Get Complete Information

Investigate *your* opportunities to save with G-E Pyranol capacitors. Ask for our catalog, "Pyranol Capacitors for Industrial Applications," (GEA-77L). General Electric Co., Schenectady, N. Y.

**Reg. U.S. Pat. Off.*

AIR-COOLED INDUCTION REGULATORS

Over-loaded circuits mean low voltage and inefficient operation of motors and lamps. G-E air-cooled induction voltage regulators will bring performance back to standard. And indoor installations are easy to make—no vault is required. (Bulletin GES-2285)

PYRANOL TRANSFORMERS

An easy way to provide for new loads. Install them indoors at *load centers* to get power right where you want it. No vaults required. Close-to-the-load installations save secondary copper, give better voltage, and reduce losses. (Bulletin GEA-2048B)

AIR-COOLED TRANSFORMERS

Like Pyranol transformers, these units can be installed indoors to obtain greater capacity plus savings in both time and materials. Particularly adapted to circuits 600 volts and below. (Bulletin GEA-897H)

GENERAL ELECTRIC

Here's the Little Device that

TELLS YOU WHEN EACH MACHINE STOOD IDLE —AND *How Long!*

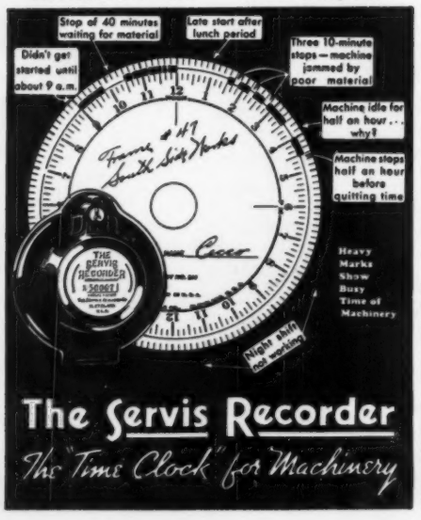
What does it cost you when machinery is idle for half an hour when it might have been producing? Suppose you could increase its running time merely 10 minutes a day. What would it mean? More than you'll ever save by "little economies."

The *big* economy in any plant is to increase productive time, if only five per cent.

You don't have to hold a stop-watch to do it. Clamp a *Servis Recorder* right to any machine and leave it there. Leave it all day. The next morning ask for the chart. No mistakes here. Your machinery has automatically written its own story for 24 hours. You can read it at a glance — busy time — idle time.

Write for folder "A Busy Plant"

THE SERVICE RECORDER CO.
1375 Euclid Avenue Cleveland, Ohio


Stop of 40 minutes waiting for material
Late start after lunch period
Didn't get started until about 9 a.m.
Three 10-minute stops — machine jammed by poor material
Machine idle for half an hour... why?
Machine stops half an hour before quitting time
Heavy Marks Show Busy Time of Machinery
Night shift not working
The Servis Recorder
The "Time Clock" for Machinery

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1 ABRASIVE BLASTING—All phases of airless blast cleaning in the metal-working field are discussed in a 16-page illustrated pamphlet on the Wheelabrator. What it is and how it works is told in detail. Tumblasts, Tablasts, and special cabinets—the three types of blast-cleaning machines—are illustrated and described. Letters from users are included. American Foundry Equipment Co.

2 ADHESIVES—If you would know more about adhesives and their many uses, you will be interested in a series of bulletins stressing the idea that "for each purpose only one (adhesive) serves best." Among those covered are adhesives for the canning, paper converting, printing and bookbinding industries. Characteristics of the various adhesives are individually outlined. The Arabol Mfg. Co.

3 AIR-COOLED TRANSFORMERS—600 volts and above. GEA-3714 gives you full information on construction of the Transformers—ventilation, insulation, structure of core. Various models are illustrated. General Electric Co.

4 "A QUARTER CENTURY OF PROGRESS"—Is the title of a 54-page brochure replete with illustrations and diagrams describing the methods, markets, and nature of the business of the five companies comprising Air Reduction Co., Inc. Object is to acquaint the public with the thousands of uses to which the company's products are put and how they are aiding defense. Air Reduction Co., Inc.

5 ARC WELDING—Vest pocket checking pad pictorially and editorially asks you questions about twenty-three typical arc welding applications for possible use by and benefit to manufacturers. Object is to help you cut costs, speed work, improve quality, and increase profits. The Hobart Brothers Co.

6 ARC WELDING CONTEST—Pamphlet lists classifications and cash awards set up for winners (first prize—$13,200) of the Industrial Progress Award Program. Brochure explains rules and conditions. The James F. Lincoln Arc Welding Foundation.

7 AUTOMATIC HEATING-CYCLE CONTROL SYSTEM — Bulletin IDS28 illustrates and describes the system in operation on furnaces for annealing malleable iron casting, including the cycle of operation, instruments, control valves, and safety devices. The Bristol Co.

8 AUTOMATIC SEPARATORS — Folder lists many companies using

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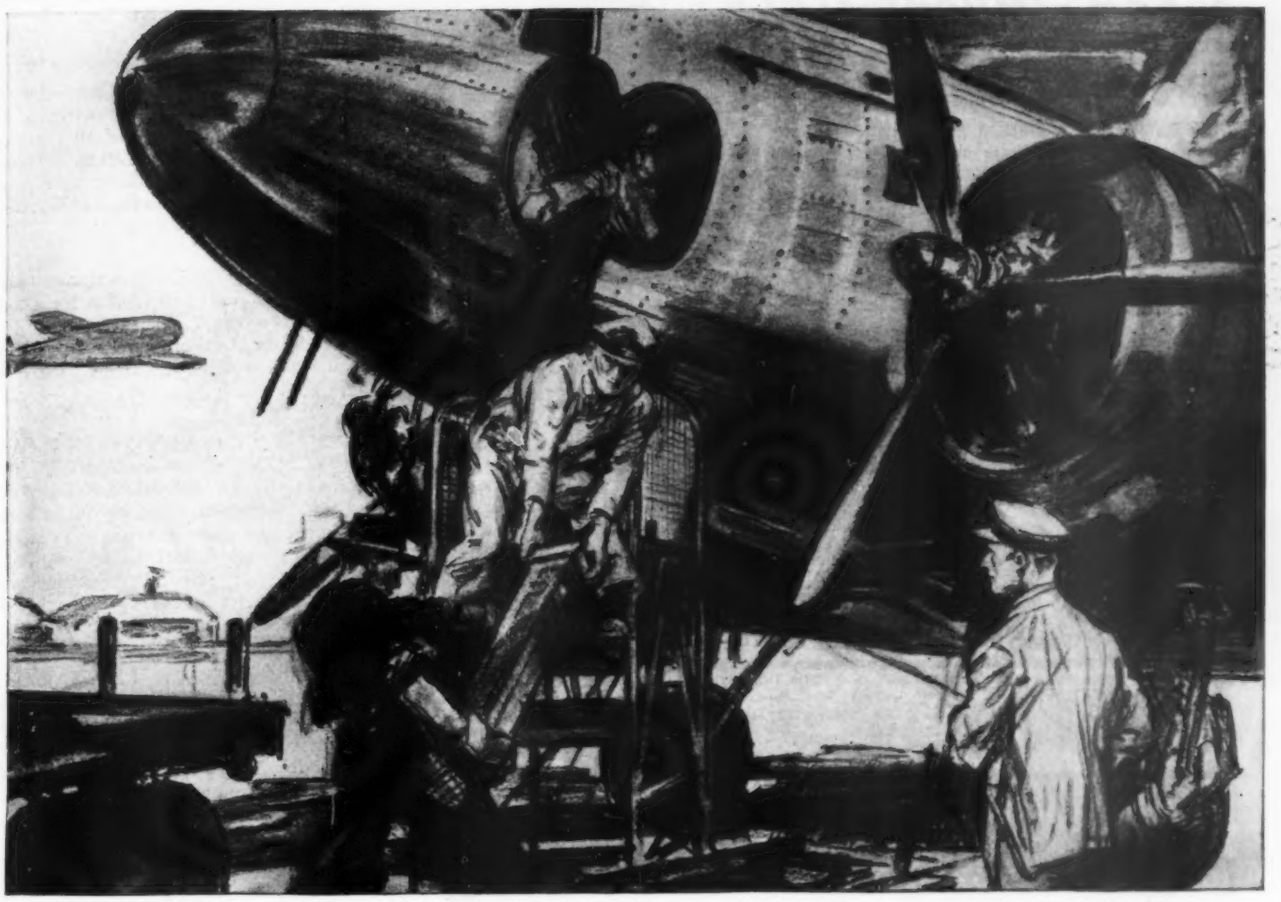

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automatic separators to eliminate oil and moisture from compressed air. Several types are illustrated and their uses and features pointed out. The Leavitt Machine Co.

9 "BASIC MACHINERY FOR THE PROCESSING INDUSTRY"—Digest of the products manufactured, including dimensions, capacities, and uses of all types of crushing, grinding, screening, sifting, washing, disintegrating, materials handling, and pyroprocessing equipment. Bulletin B6177. Allis-Chalmers Mfg. Co.

10 BELT SANDER — Description and specifications of belt sanders for woodwork and metal work. Belt travels at the right level to enable the operator to work in a natural position without fatigue. Jefferson Machine Tool Co.

11 "BETTER INDUSTRIAL BRONZES"—New members of the Ampcoloy series of bronzes are fully described and illustrated in a recent bulletin. Photomicrographs show construction of the bronzes, parts and factory scenes are illustrated. Table of physical properties and range of chemical compositions is included. Ampco Metal, Inc.

12 BOILER WATER LEVEL CONTROL—Pamphlet describes developments of boiler-water feeders, low-water cut-offs, and feeder cut-off combinations. Also shows service ranges and application of equipment. McDonnell & Miller.

13 BRUSH BRISTLES—Made of du Pont nylon are described in a 14-page booklet telling a short history of nylon; its advantages; use of the bristles in the brewery, textile, dry-cleaning, dairy, electroplating, and other industries. General physical and chemical properties are listed. E. I. du Pont de Nemours & Co., Inc.

14 CEMENT FLOORS—Form 436 tells you the features of non-dusting, oil-proof, cement, Granitex floors. Wearing properties are discussed, specifications are outlined. The Truscon Laboratories.

15 CEMENTS—Repair men, shop superintendents, maintenance departments will find a great many helpful suggestions on the use of quick-hardening iron cement for stopping leaks, making tight joints, for foundry use, for patching concrete floors, for waterproofing cellars. Information is also given on an iron putty, on aluminum and bronze cements, and on a concrete paint. Smooth-On Mfg. Co.

16 CENTRIFUGAL CASTINGS—"Ampco Metal Centrifugal Castings" is the title of a bulletin that tells you all about this process of casting and lists the benefits the customers derive through the use of this method. Pictures illustrate the process. Ampco Metal, Inc.

17 CENTRIFUGAL COMPRESSORS—20-page catalog, No. 458, is profusely illustrated with installation photographs in a wide variety of plants. Description of latest designs in large-volume, high-pressure, cen-

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Fig. 928

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Fig. 1729

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18 CONCRETE—"For perfection in concrete" a folder advises you to use water-repellant Seal-Coat that smooths and waterproofs. It also describes a transparent concrete hardener and Pave-Mastic for floor leveling and patching. Paint-Point Corp.

19 "CRAFTSMEN IN NATIONAL DEFENSE"—Is the title of a brochure picturing the company's products—steel work benches, toolroom cabinets, steel shelving, lockers, shears, presses, power brakes, welders—at work doing their part in the defense effort. Summary of facilities available is included. Lyon Metal Products, Inc.

20 "DEFENSE AND YOU"—With each copy of its latest catalog, which, in convenient pocket length, embraces specifications and illustrations of fixed condenser types and ratings generally available, this company is including a copy of a message explaining the shortages of materials and listing condenser types that can be selected with a view to aiding the defense program. Solar Mfg. Corp.

21 DEFENSE BUILDING—Building recommendations, based on European experience with air bombardment, are contained in a 24-page bulletin which points out the part windows play in relieving explosion pressure of bombs and discusses principles of design and blackout. Illustrated. Detroit Steel Products Co., Engineering Research Dept.

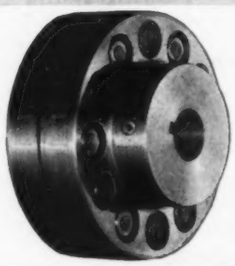
22 DRIVES AND SHEAVES—Complete line of Texrope drives is set forth in Bulletin B-6051-B—includes the new Texrope Super-7 V-belt, Duro-Brace Texsteel and True-Groove Texdrive sheaves, Vari-Pitch sheaves, etc. Selection table makes it easy to figure proper size of drive for each application. Bulletin B-6047 presents steel and cast-iron sheaves for Texrope drives from fractional to 25 horsepower. Sizes, dimensions, and prices are listed. Allis-Chalmers Mfg. Co.

23 ELECTRICAL PRODUCTS — A quick reference listing of 57 pages makes it easy for you to pick out the type of equipment you want—safety switches, multibreakers, industrial control equipment, circuit breakers, weatherproof service boxes, fuses and accessories. The various types are illustrated, specifications are given, prices are quoted. Colt's Patent Fire Arms Mfg. Co.

24 FILTERS—40-page catalog illustrates and describes line of filters for compressed air, gases, liquids, engine and compressor intake, and for building ventilation. Photographic illustrations, sectional drawings, diagrams, specification charts, detailed engineering data are included. Staynew Filter Corp.

25 FLEXIBLE BEARINGS—General engineering data, including operating characteristics for various standard size Torflex flexible bearings, are given in a recent trifugal compressors; a survey of basic principles; discussion of design, construction, and application are included. Also information on methods of drive, lubrication and control, etc. B. F. Sturtevant Co.

This AJAX CHECK CHART gives you the Answers about FLEXIBLE COUPLING DESIGN



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IS FREE END-FLOAT PROVIDED? Ajax design eliminates thrust between driving and driven machines. Electric generators or motors find their magnetic center.	YES
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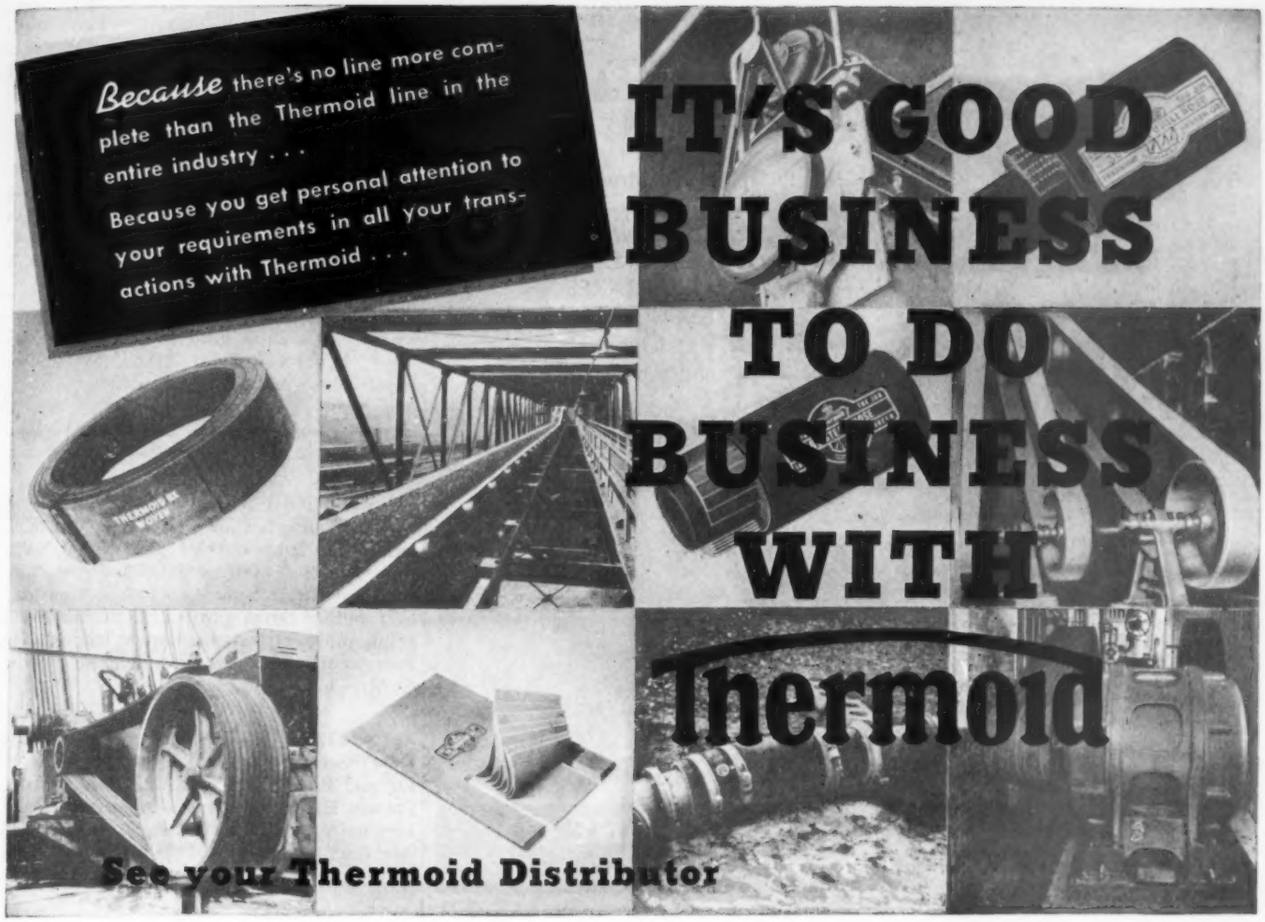
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8-page folder. Data includes radial loads, radial and axial deflections, rubber-wall thicknesses of stock sizes available from ⅛ to 5 inches diameter. Typical applications are also shown. Harris Products Co.

26 FLUORESCENT LIGHTING—"Eye-to-the-future" planning and lighting says Folder 704. Describes and illustrates fluorescent fixtures and lamps for office use, explains mountings and construction, suggests layouts. Edwin F. Guth Co.

27 FLUORESCENT LIGHTING UNITS—Bulletin illustrates a line of improved fluorescent lighting units containing one, two, three, and four lamps. Special spray-booth light is also shown. Specifications are given. Infra-Red Ray Devices, Inc.

28 FLUORESCENT LUMINAIRES—Catalog Section 61-152 contains tabulations on lamp wattage and circuit volts, prices for two or three lamp units, and installation data for the two units. Construction outline gives physical dimensions and graph shows typical distribution curves of a fluorescent luminaire. Westinghouse Electric & Mfg. Co.

29 FLUORESCENT UNITS—Catalog Section FL-4 and accompanying Catalog and Price Sheet FL-5A list and describe the new Deluxe glass-inclosed fluorescent lighting units and Line-O-Lamps. Price and specification data on the 4-lamp, V-type lighting unit are included. The Wiremold Co.

30 FUEL METERS—Diesel owners and operators usually know how much fuel oil their engineers should burn. Few, however, know how much actually is burned in relation to kilowatt-hour or horsepower. Bulletin tells about the Vesta fuel oil meter that provides continuous record of fuel consumption in tenths of a gallon. Comparing this figure with power produced indicates whether operating conditions are correct. Fluid Meters, Inc.

31 GRINDING—Essential facts about grinding—the what, why, and how—are discussed in a 32-page booklet, Form 1944. Most of the material deals with grinding and grinding machines in general yet is fundamental in nature. Purpose is to acquaint apprentices and trade and technical school students with the construction and operation of the machines. Norton Co.

32 HAND-OPERATED SCREW MACHINE—Model 601 Rapiduction turret lathe is described in detail in an 8-page bulletin. Features of the turret, cross slides, spindle nose are explained and illustrated; construction details are pointed out; specifications are listed. The Oster Mfg. Co.

33 HAND PUMPS—"More gallons per penny," says a folder showing how easy it is to handle gasoline, kerosene, oils, chemicals, paints, alcohol, and other liquids with hand pumps. Pictures various styles fitted for pipe installations, for wall or other vertical surface mountings, with flange on base for flat mounting, in direct and gear-

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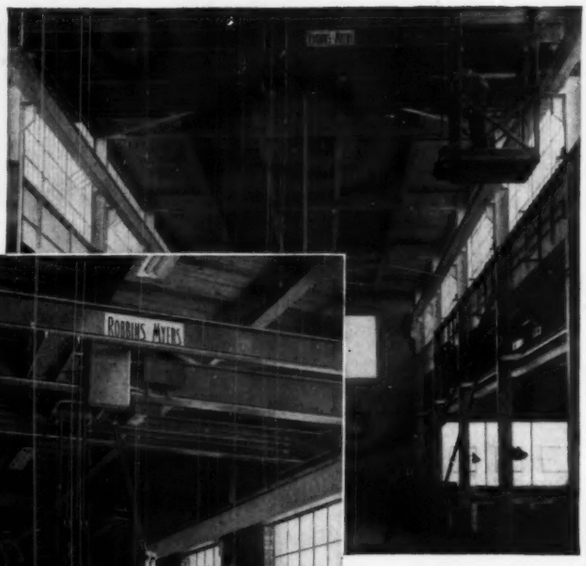
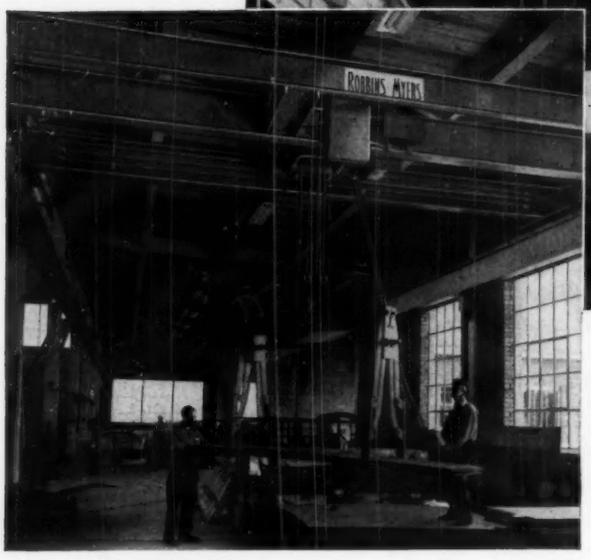
Here's the 5-ton cab- and floor-operated R & M crane used for loading and unloading railroad cars by the Chicago Metal Mfg. Co., Chicago, one of the largest and busiest sheet-steel fabricating plants in the Middle West. →





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"These R & M cranes are saving us time in loading and unloading trucks and railroad cars and getting material to and from the proper production lines. We are now able to handle a greater volume of material without any tie-ups at the shipping and receiving platform or in the shop. The cranes were installed last July, are giving more than satisfactory service, and are rapidly paying for themselves in time and money saved."

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head drive. Specifications listed. Bulletin 205. Blackmer Pump Co.

34 HEATERS – Automatic, gas-fired, forced-air heaters are described and the different models are illustrated in Catalog AFA41A. Construction, features, and operation are discussed. Dimensions, capacities, and other specifications are listed. Reznor Mfg. Co.

35 HEATING—Standard convectors for free-standing, wall-hung, or fully recessed applications are described and illustrated in Bulletin C-451. Capacities are listed. Bulletin 751 contains information on design and construction of radial-type unit heaters. Arrangements for typical installations are diagrammed, steam capacities, specifications, and other data are listed. Includes wiring and piping diagrams. Bulletin 746 contains similar information on downflow unit heaters. McQuay, Inc.

36 HEAVY-DUTY COMPRESSORS – Horizontal, single-stage compressors, 5-125 horsepower, pressures up to 150 lb. per sq. in. gage are the subject of Bulletin 194. Picture spread points out construction features, text describes construction in detail, typical methods of drive are pictured, and illustrations show the compressors at work. Pennsylvania Pump & Compressor Co.

37 HEAVY-DUTY DIESELS – Modern installations of heavy-duty diesels are pictured in an impressive 80-page booklet illustrating installations in municipal and industrial plants. Captions list equipment used and typical annual earnings resulting. Map of the United States locates the many hundreds of installations throughout the country. Fairbanks, Morse & Co.

38 HUMIDITY CONTROL—In air conditioning. The importance of proper humidity control in air conditioning to produce real comfort and so maintain or increase production levels is stressed in two folders explaining the Kathabar system and telling what it can do for you and your employees. Forms K-41-2 and K-41-3. Surface Combustion Corp.

39 HYDRAULIC DRIVES – Hydraulic drives, their varied applications and advantages, design and performance are fully described in a handsomely illustrated booklet dealing with hydraulic drives, clutches, torque converters. Bulletin 132. Twin Disc Clutch Co.

40 HYDRAULIC MACHINERY—The many ways in which self-contained, high-speed hydraulic machinery and equipment can help speed production are pictured and described in a 44-page bulletin, No. 110-A. Section one contains 61 large photographs of hydraulic presses, pumps, jacks, and high-pressure valves complete with descriptions and information on use, operation, dimensions. Section two includes selective engineering tables, charts, and other material. Watson-Stillman Co.

41 INDUSTRIAL INSTRUMENTS – The Solu-Bridge controller for automatic solution control is the subject of Folder

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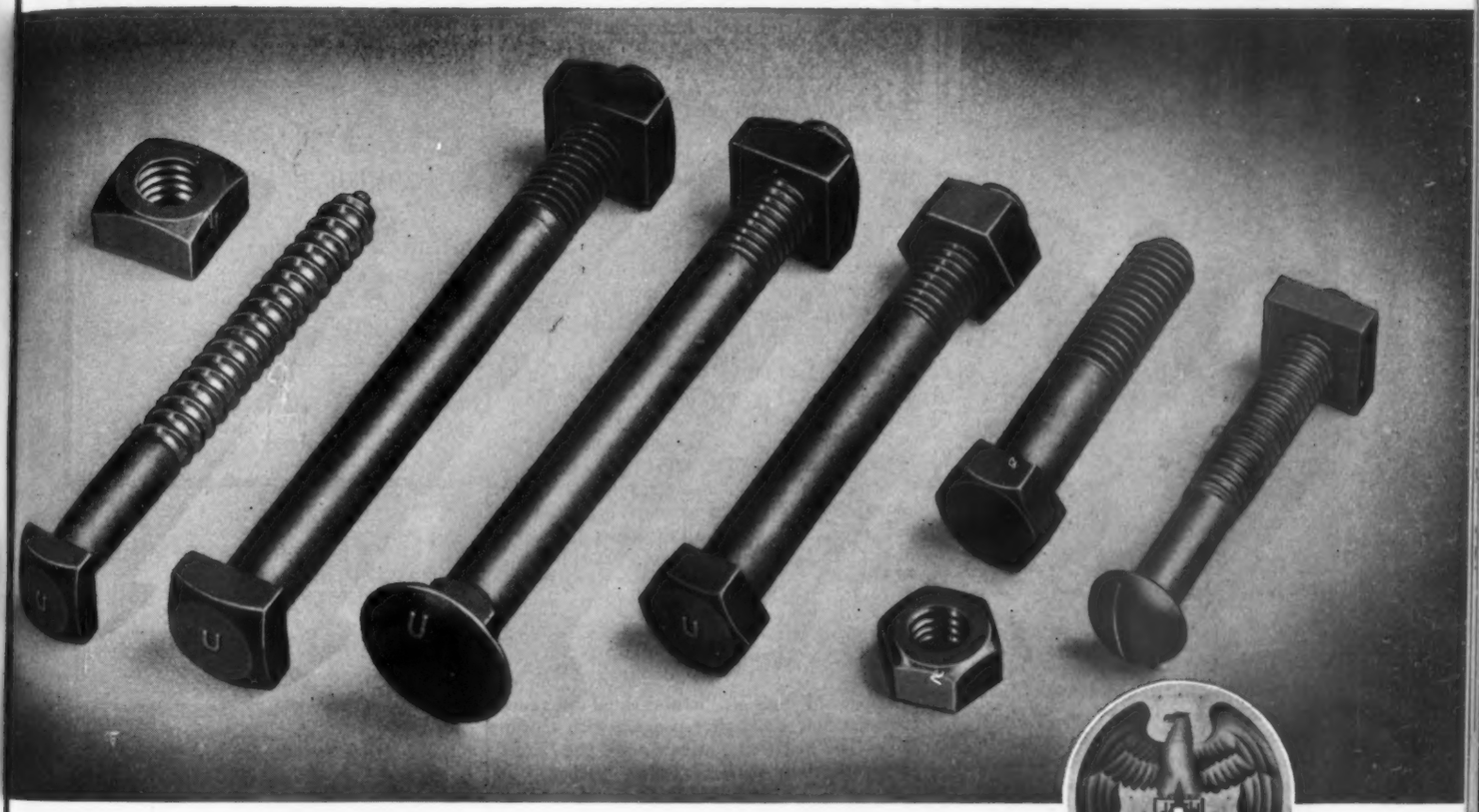
REPUBLIC UPSON QUALITY BOLTS AND NUTS KEEP ASSEMBLY LINES ROLLING FASTER



If you're looking for more production, don't overlook those small parts that make a big difference in bolted assembly speed—Republic Upson Quality Bolts and Nuts.

Upson Quality Headed and Threaded Products save seconds on assembly operations—step up unit output. They are accurate to size over all dimensions—fit the holes and wrenches they're made to fit, easily. Their full, clean threads permit turning up to a tight grip quickly. Heads are full-bodied, sharp-cornered—prevent wrench slippage. They'll take tight wrenching without breakage.

There are more than 20,000 items in the Republic Upson Quality Line to meet your bolted assembly needs. That's a lot of ways to speed production. Better investigate, today.

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RESEARCH WILL NOT STOP!

One of our most important activities at Republic always has been research. Today's emergency has not retarded this work. On the contrary, it has greatly intensified our efforts.

We are carrying on a relentless and unceasing program directed toward the development of new steels for certain critical defense problems and the improvement of present steels.

Laboratory and plant research, commercial market research, product development research—all are exploring every possible avenue which may lead to *better* Republic steels for you in the future.

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PRESIDENT

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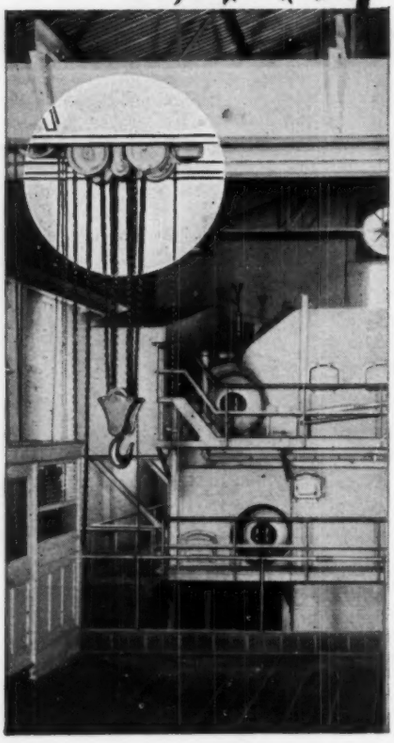
HEADED AND THREADED PRODUCTS



An old stable in Utah was being converted to a modern power house. First move was to install this 15-ton, 36' span Reading Crane. Then, with its help, 800 cubic yards of dirt were moved, 600 cubic yards of concrete poured, and two 18-ton, 250 H.P. boilers and two 500 H.P. uniflow engines installed, together with generators, exciters, etc.

"The crane was also used," says the Contractor, "for painting the ceiling and other purposes. Frankly, during the construction it saved the owner and ourselves more than its cost." Now it's standing by for coal and ash handling and emergency use.

No need to say more—just remember that it was Reading-designed and built—and there are more where it came from.

READING CHAIN & BLOCK CORP.
DEPT. 111 READING, PA.

READING
Chain Hoists, Electric Hoists,
Cranes and Monorails

RD-102 which tells about this system for testing, control, and preparation of industrial solutions. Various models are described. Folder RC-116 discusses electrolytic conductivity measurements with Series R.C. conductivity bridges. Illustrated, prices given. Industrial Instruments, Inc.

42 INSTRUMENTS FOR THE CANNING INDUSTRY—The purpose of Bulletin 12-5 is to illustrate the trend modern progressive canners are taking. Well illustrated with pictures and diagrams it includes working drawings of various food processing operations and halftones of indicating and recording control thermometers, non-indicating temperature controller and control valves. Page of drilling and mounting dimensions is included. The Brown Instrument Co.

43 LIGHTNING ARRESTORS – For voltage regulators and boosters installed on distribution systems are described in a new leaflet, Descriptive Data 38-110. Application information for indoor and outdoor circuits is given in detail with size recommendations for use on 2,400- to 8,320-volt, single- and 3-phase circuits. Wiring diagrams show arrester connections for grounded and ungrounded circuits. Westinghouse Electric & Mfg. Co.

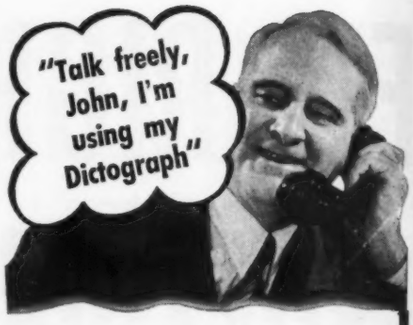
44 MULTI-POLE CONTACTOR—Leaflet 3283-A describes a multi-pole contactor for use on machine tools and controllers as relays in control circuits, to control small motors. Applications are explained, construction details are given, and instruction for maintenance explains removal of contacts and renewal of parts. Illustrations and tabulations are included. Westinghouse Electric & Mfg. Co.

45 PACKAGING—Data Sheet 10 discusses Corroflex speed packing and how you can save in time, material, weight, and space by using it. Pictures show difference between before-and-after packing with Corroflex. The fact that you can make the "exact size protection pack for every package" is stressed. The Corro-Cutter is also described. Sherman Paper Products Corp.

46 PNEUMATIC TOOLS—Catalog 41 illustrates a line of pneumatic tools for industry—grinders, rotary files, drills, screw drivers, nut setters, socket wrenches, etc.—and gives specifications for each tool. Accessories are listed. The Aro Equipment Corp.

47 PORTABLE BUCKET LOADERS—Catalog 759. General specifications of Type 211-A Junior bucket loader and Type G portable bucket loader and fertilizer and digger loader are listed, dimensions are diagrammed, and uses in reclaiming coal, coke, sand, fertilizer, crushed stone from ground storage are illustrated. The Jeffrey Mfg. Co.

48 POWDER METALLURGY – As a practical answer to the production of bearings, gears and cams, and miscellaneous metal parts is discussed in Bulletin 102. Tells some of the specific parts for which Durex Iron has been successfully utilized—radio tuning brakes, oil pump gears, guide blocks



When the Dictograph is used, *absolute privacy* is assured, because there is *no way* for *anyone* to listen in. Even the soft-toned loud-speaker can be silenced by a handset. That's what we mean by "dual reception."

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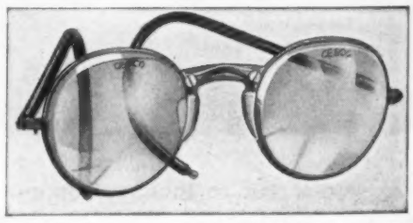
Spectacle-Type Goggle . . . !



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Available in three bridge widths ranging from No. 20, narrow—No. 22, medium—and No. 24, wide.

Furnished with Cesco Hardened lenses meeting Federal specifications.

Available also with Transparent Side Shields and Leather Padded Side Shields.

Cesco "Comfort-Bridge" Above rear view shows wide bearing Jumbo Pads. Non-flammable plastic, the entire bridge is easily removed or replaced. Brace bar engages frame at 4 different points for strength and rigidity.

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Acme Unit-Load Bands (for bracing all types of products in cars) and Steelstrap (for reinforcing individual shipping packs) permit safe and speedy capacity loading—reduce tare weight—simplify unloading—release cars faster for other needs. Thus carload and pool car ladings, bundles, cartons, bales, boxes and skid-loads can maintain the acceleration of increased production from source to final destination.

During World War I, Acme Steelstrap provided proper reinforcement for countless shipments . . . has continually been protecting merchandise for both civilian and defense needs.

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Sometimes it's better to *bring* the food to the busy worker . . . rather than waste crowded minutes or use needed floor space for a conventional employees' cafeteria. For such occasions, Pick engineers developed this "cafeteria-on-wheels" that holds everything, rolls everywhere, brings food and refreshment wherever men pause from their labors at mealtime.

It's a marvel of efficient planning — holds soup and hot dishes, sandwiches and coffee, pastry, cold drinks, candy and tobacco. Hot foods are kept piping-hot by self-contained fuel or plugged in electricity.

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Allison Engineering Corp. Speedway, Indiana
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for machine saws, textile machine bearings, cams. Moraine Products Division, General Motors Corp.

49 SAFETY EQUIPMENT – Complete protection from head to ankles is provided by the safety items described in a new catalog—includes goggles; Calobar lenses; Super Armorplate lenses; welding lenses, plates, helmets, and hand shields; safety clothing; respirators; first-aid kits. Eye protection guide outlines industrial classifications, types of eye-hazardous jobs, equipment for protection; table gives suggestions for choice of proper shade of glare-protection glass for jobs involving exposure to glare. American Optical Co.

50 SCALE, CORROSION, AND WATER TREATMENT PROBLEMS—Of particular interest to chemists and engineers is a group of articles reprinted from the most popular ones that appeared in the company's house organ, "H-O-H Lighthouse." Problems discussed cover cooling systems, hot water systems, boilers, and return systems including special data on corrosion inhibitors, scale preventatives, protective coatings, proportioning equipment, and refrigerating brine. They are illustrated with tables, charts, graphs, and photographs. D. W. Haering & Co., Inc.

51 SKIN CLEANSER—And skin conditioner. Illustrated folder outlines physical and chemical features of Paxsavalene, tells the why and wherefore of its advantages. G. H. Packwood Mfg. Co.

52 SNAP GAGES—Gages made of Meehanite are described in a recent bulletin. This special metal is said to combine the best properties of cast iron and steel with high tensile strength. Gages are made in the United States, to AGD Standards. Bulletin shows various sizes obtainable, outlines specifications, and pictures a snap-gage stand. George Scherr Co., Inc.

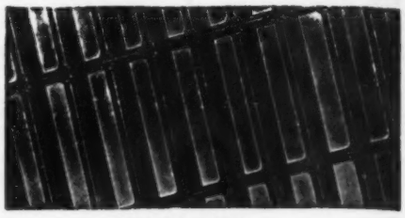
53 STAIR TREADS, FLOOR TILE, THRESHOLDS—Folder tells you all about Ten-Lox anti-slip stair treads, thresholds, and floor tile. Ten advantages are listed, illustrations show some of its uses, sizes and specifications are included. The National Bronze & Aluminum Foundry Co.

54 STEEL—Carbon tool steel and chisel steel, with their uses and specifications, are discussed in two pamphlets. Carbon tool steel is suitable for general tool purposes, is supplied in any section in standard sizes and tempers, while chisel steel is for use where extreme toughness and resistance to fatigue are essential requirements. Jessop Steel Co.

55 STEEL AND METAL-CUTTING TOOLS AND BLANKS—Catalog 42 covers specifications and prices of standard steel-cutting carbide tools and blanks. Typical applications of each style tool are illustrated. Selection and design of tools and blanks are discussed together with other pertinent engineering data and information on chip breaker designs, correct grinding procedure, etc. 36 pages. McKenna Metals Co.

56 TACHOMETERS—Production control means planned control says a re-

When you need grates
Specify **BATES**
FOR LONG-TIME ECONOMY



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Each intersection, and consequently, each complete panel of Batesgrates, is strictly one piece. Non-slip, sharp top edge, self cleaning cross bars like the ridge of a roof. No cracks, joints, or acute angles. No grooves to hold grease and dirt and create slippery spots. Batesgrates are an engineered assembly of bars — all bars work.

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Cut down machine repair delays, avoid damage to costly parts, reduce accidents, conserve time and man power – with the

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oTc patented non-slipping GRIPOMATIC PULLERS and oTc PUSH-PULLERS for removing and installing gears, bearings, wheels, shafts, pulleys, etc. . . . easily, quickly, safely. Capacities 5 to 50 tons. SPECIAL TOOLS made if needed.

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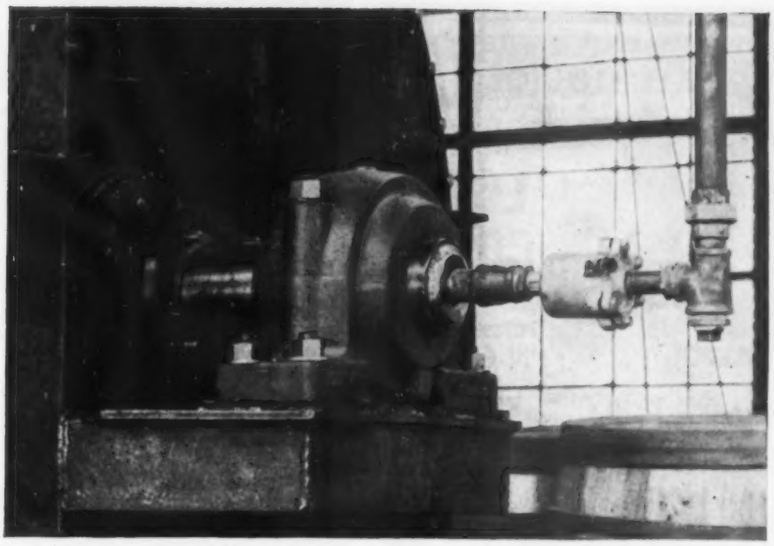

● *An SKF Pillow Block doing its bit on a Dreg Still built by Read Mach'y Co., Inc.*

Huge Production is in order if we are NOT to gamble with Security. And to make certain of that Production, wise manufacturers guard the bearings on the machines they build with SKF Pillow Blocks. Designed for heavy duty, these rugged pillow blocks are easy to assemble, inspect and lubricate . . . prevent lubricant leakage . . . stop dirt and water from entering. Result: smooth and continuous bearing performance that means smooth machine performance—and *that* means More Production. 4935

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cent bulletin explaining use of tachometers in the rubber and textile industries and in other applications. Also discusses tachometer drive equipment and gives ordering information. Form 18-12-CC. Stewart-Warner Corp.

57 THERMOCOUPLE DATA BOOK AND CATALOG—A complete compilation of data for thermocouple users contains 32 pages of information on temperature conversion tables, millivolt tables, pipe and wire sizes, decimal equivalents, wire resistances, recommendations for checking thermocouples and pyrometers, information on how to construct thermocouples. Prices and descriptions are given so that thermocouples can be selected and ordered direct from the catalog, No. S2-3. Wheelco Instruments Co.

58 THERMOMETER AND PRESSURE GAGE ACCESSORIES—Supplementary catalog, No. 6706-A, lists and describes bulbs, sockets, tubing, and other items for the complete line of the company's thermometers and pressure gages. Information and specifications have been compiled with the object of simplifying orders direct from the catalog. Illustrated throughout. The Brown Instrument Co.

59 TOILET BOWLS—Illustrated folder printed in two colors describes super force cup that is built to exert extreme pressure. Intended for use in public buildings, factories, and so on. Keystone Brass & Rubber Co., Inc.

60 VIBRATORY MATERIAL HANDLING EQUIPMENT — Different ways in which savings can be accomplished, capacities increased, quality of product improved, production costs lowered are pointed out in Catalog 416. Describes such equipment as vibrators for hoppers, bins, and chutes; conveyors, feeder machines; packers and jolters; electric hammers for maintenance work; replacement shaft seals; hopper level switches; etc. Illustrated throughout. Syntron Co.

61 WELDING CABLE—FlexArc welding cable for work leads and electrode holders is described in Leaflet 26-630. Discusses features and application of the holders, tabulates welding currents from 50-700 amp. and voltage drop per 100 feet for cable sizes of from 3 to 4. List prices, discounts, delivery, and terms are given. Westinghouse Electric & Mfg. Co.

62 WELDING POSITIONERS—A 12-page bulletin, No. 200, shows many national defense items that illustrate the desirability of position welding in the interest of increased production. Positioners range in capacity from 2,500 lb., hand operated, to 8 tons, motor operated. Details and dimensional drawings are included. Ransome Concrete Machinery Co.

63 WHEEL FILES—"Put your cards on wheels for convenience and speed," says a folder describing a card filing system whereby cards are filed on wheels which may be sunk into desks, portable cabinets, or tables designed for the purpose. Sizes and prices are quoted and installations are illustrated. Wheeldex Mfg. Co.

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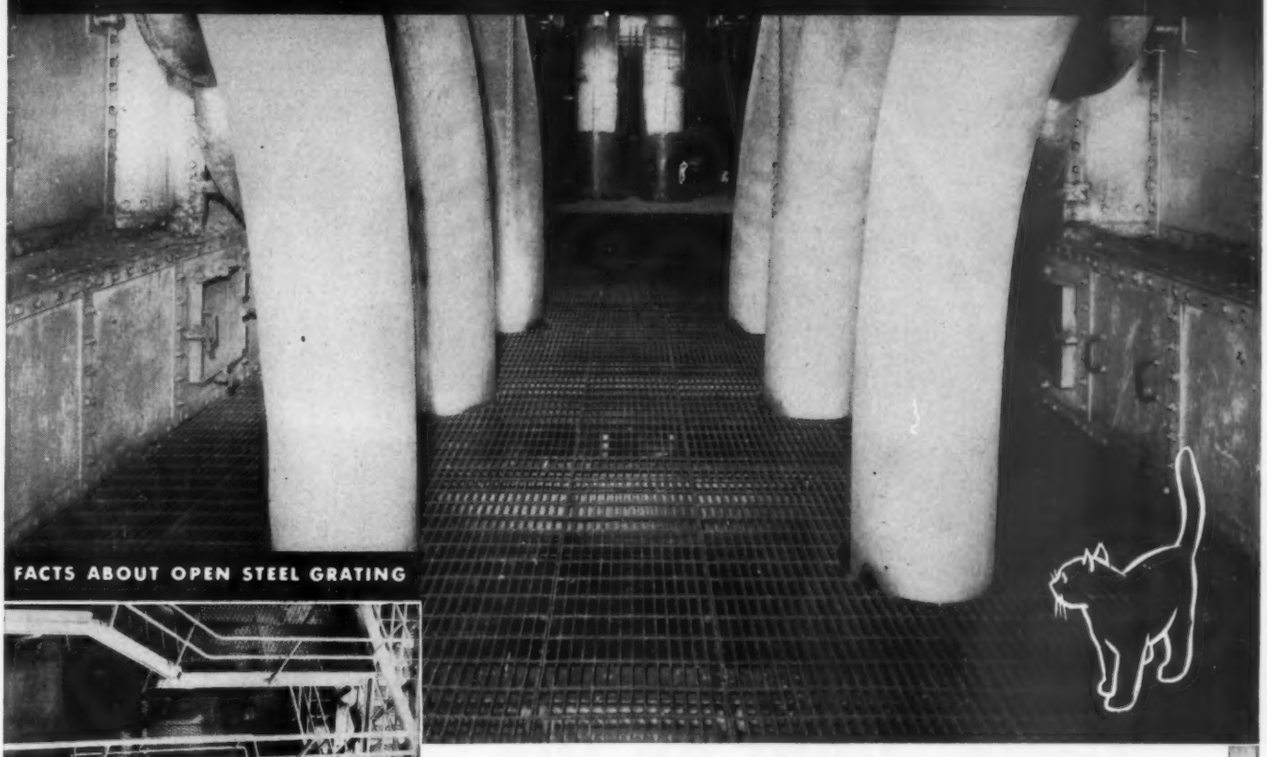
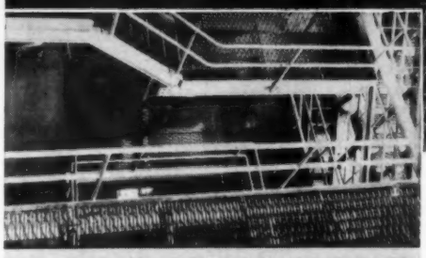
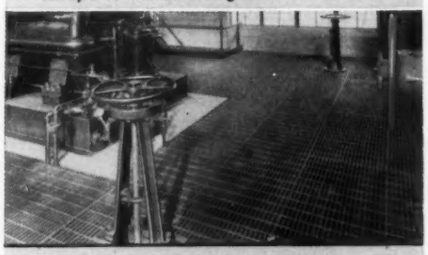


FACTS ABOUT OPEN STEEL GRATING



FREE CIRCULATION OF LIGHT AND AIR. Because of its construction, Open Steel Grating lets light through to spaces above and below—gives free ventilation and escape for fumes and gases.



SELF-CLEANING. Open Steel Gratings do not accumulate dust, dirt, grease, oil or moisture. Their construction makes them virtually self-cleaning.

TO insure a perfect "tailor-made" fit and to reduce the time required for installation, most Open Steel Grating Floors are factory-fabricated to the exact dimensions and requirements of the individual job. Stock sizes of grating are also available, where the job does not necessitate this "tailor-made" accuracy. Fastening devices are installed from the top surface—eliminating the use of scaffolding.

Floors of Open Steel Floor Grating are factory-fabricated from a combination of structural steel members rigidly connected by welding, interlocking or riveting. Though strong and rigid, their weight is the minimum necessary to carry and distribute a given load with an ample factor of safety.

Open Steel Floor Grating gives the architect, engineer and designer a greater latitude in floor design, plus many features he cannot secure with other types of floor construction. For complete technical information on many types of Open Steel Floor Grating, write today for a *free* copy of the new 28-page booklet, "New Ideas in Functional Floor Design."

This seal is your assurance OPEN STEEL FLOORING INSTITUTE INC. *of a quality product*

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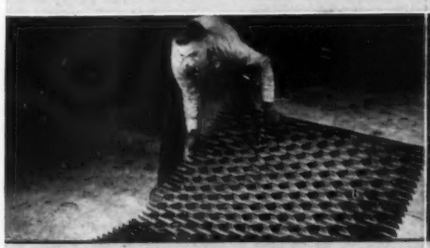

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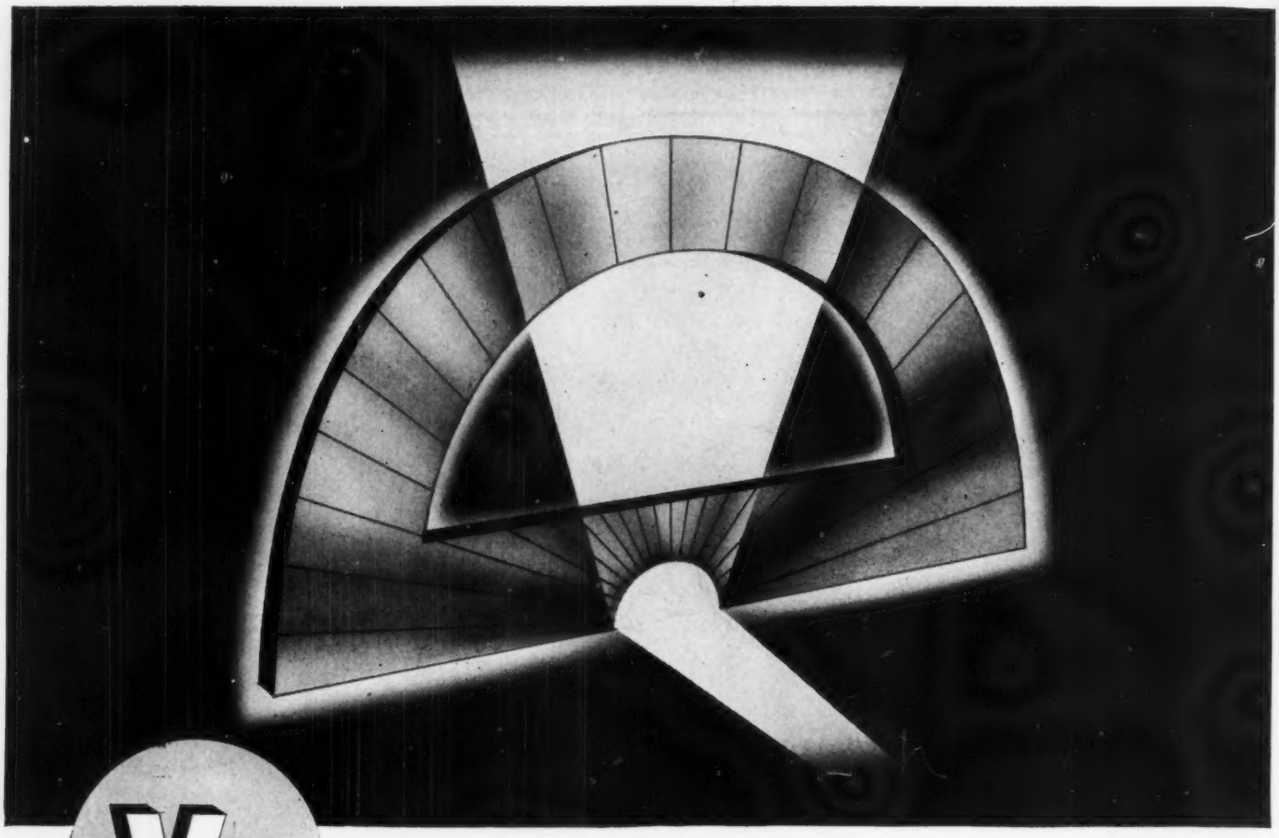

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REMINGTON RAND STEEL FILES AND FILING SYSTEMS meet the most exacting requirements of reference speed and centralized filing control.

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REMINGTON RAND SAFE-FILES operate with greater convenience than uninsulated steel files, yet supply certified fire-protection for important material.

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Control GETS RESULTS in Soldering, *Too!*

Control of both flux and alloy—as to both quality and quantity—the *positive control* that you get with Kester Cored Solders—is essential to perfect results in every soldering operation.

Production is smoother with Kester Cored Solders, due to proper balance of self-contained flux and pure, virgin metal alloy. Hit-and-miss soldering is eliminated.

Results are *permanent*, because Kester Cored Solders—due to purity of flux and alloy—resist shocks, vibration, contraction and expansion.

Kester Cored Solders are available to industry in a wide range of fluxes, alloys, core-sizes and wire-sizes. Kester engineers will gladly help you determine the combination best adapted to any operation. Consult them without obligation!

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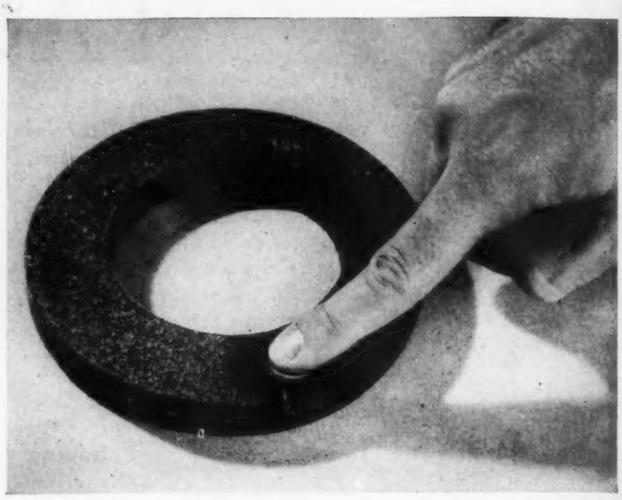
STANDARD FOR INDUSTRY

THE "BLUSH" THAT MEANS...
BALL BEARING INSURANCE!

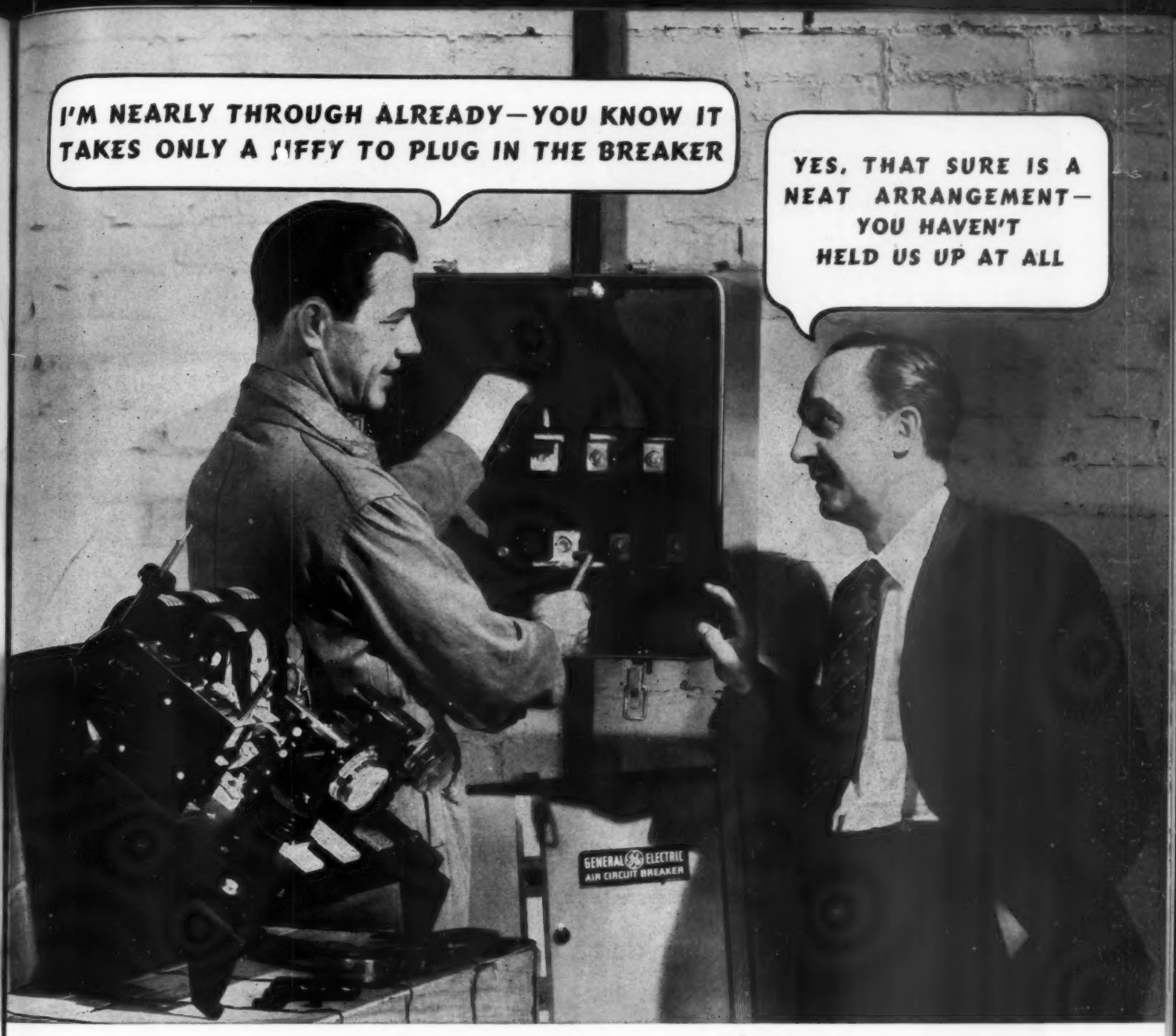


FELT is the only oil reservoir that holds oil always ready for distribution. The slightest touch brings friction which wicks oil to the surface in a bright pool. That "blush" is never-failing insurance for ball bearings, and is the reason why leading manufacturers depend on AMERICAN FELT Washers, made to their *precise* specifications, to insure lifetime satisfaction to users of their ball bearings. In addition to vast quantities of washers, which are saturated with oil and sealed within bearing assemblies, we supply large quantities of wicks. We will deliver cut parts to your *precise* specifications *exactly* when you want them. You can depend on our two sources of supply, *i.e.*, modern cutting shops at Detroit, Mich., and at Port Chester, N. Y., manned and managed by men who *know* FELT and how to convert it. Please write for Data Sheet No. 6, Felt and Lubrication.

American Felt Company
TRADE MARK

General Offices: GLENVILLE, CONN.
Plants at Glenville, Conn., Newburgh, N. Y., Franklin, Mass., Detroit, Mich.
Sales Offices at New York—Chicago—Philadelphia—Boston—Cleveland—Detroit—St. Louis—San Francisco

PRODUCERS OF FINEST QUALITY PARTS FOR OIL RETAINERS, GREASE RETAINERS, WICKS, DUST EXCLUDERS, GASKETS, INSULATING FELTS, CHANNEL FELTS, UPHOLSTERY RISER STRIPS, BODY SILENCING PARTS, DOOR MECHANISM GASKETS, AND BODY POLISHING WHEELS


I'M NEARLY THROUGH ALREADY—YOU KNOW IT TAKES ONLY A JIFFY TO PLUG IN THE BREAKER
YES, THAT SURE IS A NEAT ARRANGEMENT— YOU HAVEN'T HELD US UP AT ALL
GENERAL ELECTRIC AIR CIRCUIT BREAKER

Here's Why This New Removable Breaker Is So Easy to Install

HERE'S a breaker that sets a new record for quick installation. With the case bolted in place, it's easy to connect the cables—there's plenty of room to work. And then it takes but a moment to plug in the breaker unit, which has contacts that readily engage those in the case.

This new removable breaker saves valuable time when in service, too. In fact, it's called the *3-minute breaker*, because, with it, you can re-establish service after temporary faults in less than one minute; inspect the breaker in safety—away from live parts—in less than *two* minutes; and where load conditions have changed, you can interchange breaker units in less than *three* minutes.

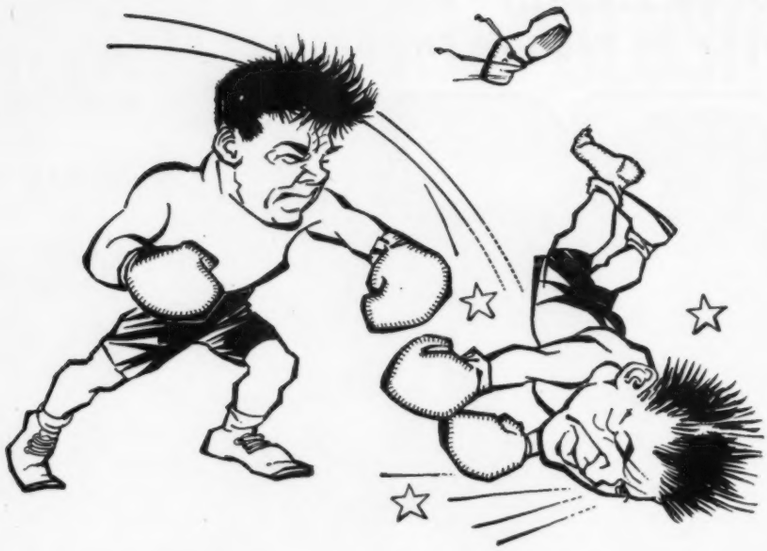
Install these new AE-1 breaker units in lighting, power, and motor circuits. They will protect both the circuit wiring and the apparatus connected to the circuit. They will guard against the prolonged delays and the damage often caused when less adequate protective devices are subjected to severe short circuits.

A new illustrated booklet (GEA-3600) tells how and shows where to use these breakers. For a copy, write the G-E office near you, or address *General Electric Co., Schenectady, N. Y.*

THE BREAKER WITH THE DISCONNECT FEATURE

GENERAL ELECTRIC

860-24-7500



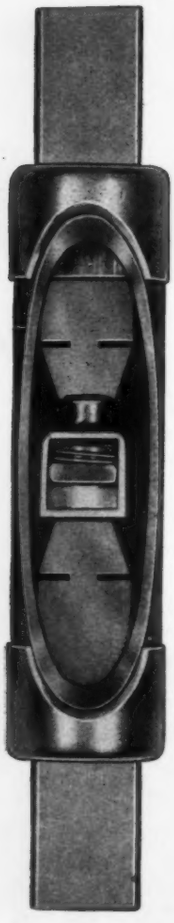
TAKE THAT FOR

interrupting—because interruption of electrical service can be just as damaging, and bring plant operations to a standstill. Don't let inefficient protection knock your service out;

USE

THERM-A-TRIPS

(fuses with thermal cutout)



They prevent damage from short circuit, and provide a long, safe time-lag, thus permitting the safe starting and running of single motors or of a series of motors under load. Therm-A-Trips can be easily replaced, and have advantages over mechanical devices because they are small and compact, cost little, and are long-lived. Available in 0 to 600 ampere, 250 and 600 volt. Ask your dealer, or write for our Bulletin 405.

THE CHASE-SHAWMUT COMPANY
NEWBURYPORT, MASSACHUSETTS

FUSE MAKERS SINCE 1893

As Machines Speed Up for Defense Production — — the need grows greater and greater for

LINCOLN

Industrial LUBRICATING EQUIPMENT

1—Filler-Type Grease Guns

2—KLEENSEAL and Button Head Grease Fittings

Periodic lubrication, the Lincoln way, will cut down bearing failures and prevent delays in producing defense orders

LUBRICATION is the first line of defense against needless wear and tear on industrial machinery. The Lincoln line of industrial lubrication equipment is complete and includes:

Lever-Type Grease Guns
Push Type Grease Guns
Electrically operated Grease Guns
Air operated Grease Guns
Kleenseal Grease Fittings
Button Head Grease Fittings
Special purpose Grease Fittings

CENTRO-MATIC LUBRICATING SYSTEMS are available for a wide range of applications including full automatic power operated installations with time clock control, semi-automatic and manually-operated systems . . . All the equipment and accessories necessary for dispensing grease from the original container to the bearing safely, efficiently and without danger of contamination.

Put your lubricating equipment problems up to Lincoln—specialists for seventeen years. Catalogs on request.

141-5A

Coast-to-Coast Authorized Sales and Service

LINCOLN ENGINEERING COMPANY

Pioneer Builders of Engineered Lubricating Equipment

ST. LOUIS, MO., U. S. A.

THIS TEST PROVES... ...YOU CAN DO THIS!

1. Rockbestos A.V.C. Boiler Room and Lighting Wire (Underwriters' and Nat. Elec. Code — Type AVA maximum operating temperature 110°C. (230°F.)
2. Rockbestos A.V.C. 600 Volt Power Cable (Underwriters' and Nat. Elec. Code — Type AVA maximum operating temperature 110°C. (230°F.)
3. Rockbestos A.V.C. 600 Volt Motor Lead Cable (Underwriters' and Nat. Elec. Code — Type AVA maximum operating temperature 110°C. (230°F.)

The blowtorch test proves that Rockbestos permanently insulated wires and cables are *more than fireproof!* It gives a visible demonstration of the fact that they are *inherently heatproof* and made to stand up in such applications as the Rockbestos-wired steam valve control room above where 180°F. is normal.

Some wires are flameproof for a limited period but are not fireproof or heat-resisting. Others are heat-resisting under limited operating temperatures but are not flameproof or fireproof. Rockbestos permanently insulated wires and cables take the blasting, red-hot flame of the torch without igniting or burning and the destructive drubbing of persistent high temperatures around boilers, furnaces, glass lehrs, rheostats, soaking pits and steel conveyors without drying out or becoming brittle, because they are *inherently heatproof, positively fireproof,* and resistant to alkalies, moisture, oil, grease and corrosive fumes as well.

If you want to keep your production *moving*... spot your trouble spots . . . anticipate your minimum footage requirements as far in advance as possible . . . and get ready to rewire with permanently insulated Rockbestos wire, cable or cord.

For a catalog and samples write to: Rockbestos Products Corporation, 824 Nicoll St., New Haven, Conn.

Also Refer to McGraw-Hill Electrical Buyers Reference

Anticipate Your Requirements!

New York Buffalo Cleveland Detroit Chicago
Pittsburgh St. Louis Los Angeles San Francisco Portland, Ore. Seattle

Rockbestos All-Asbestos Power and Rheostat Cable — Underwriters' and National Electrical Code Type AI — one of 118 different permanently insulated wires.

Guard Your Factory Against
HIGH BLOOD PRESSURE

Pipe lines are the "arteries" of your factory. Protect yourself against artery trouble by using

VALVES HYDRANTS

and

PIPE LINE ACCESSORIES

M & H products have been used in industrial plants for many years for conveyance of water, gas, steam, oils, acids and chemicals.

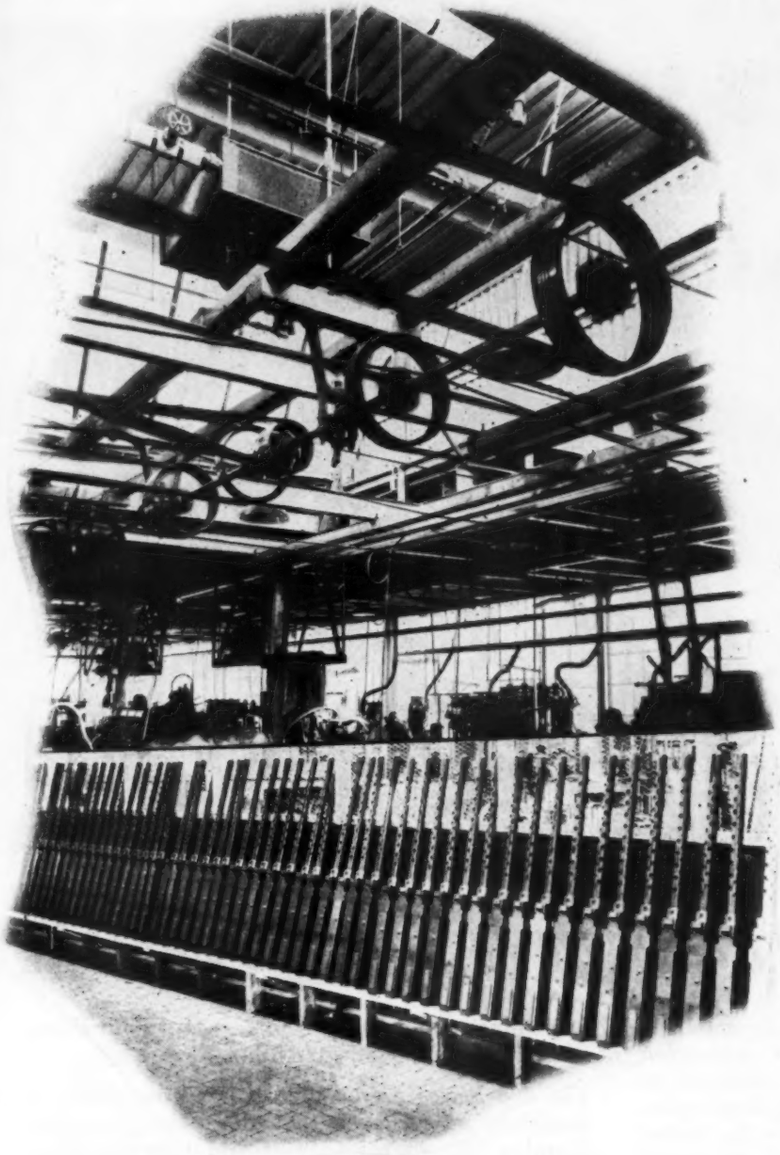
M & H Gate Valves are cast iron body, bronze mounted, with double-disc parallel seat, or Solid Wedge type, Non-Rising stem or screw and yoke. They come either with flanged or screwed connections. Valves in fire protection line are marked "UA-FM" to denote approval of both the Underwriters and the Factory Mutuals.

M & H PRODUCTS INCLUDE - - -

- SQUARE BOTTOM GATE VALVES
- TRAFFIC MODEL FIRE HYDRANTS
- CHECK VALVES
- FLAP VALVES
- TAPPING VALVES
- MUD VALVES
- FLOOR STANDS
- EXTENSION STEMS
- SHEAR GATES
- SLUDGE SHOES
- FLARED FITTINGS
- B & S FITTINGS
- FLANGED FITTINGS
- WALL CASTINGS
- TAPPING SLEEVES
- VALVES BOXES
- SPECIAL CASTINGS

M&H VALVE
AND FITTINGS COMPANY
ANNISTON, ALABAMA

Short Cut To Stingers For Uncle Sam's Wasps



Bullets come out of them like water out of a fire hose — 800 a minute. They're 50 Caliber Browning Basic Machine Guns for fighting planes . . .

But their manufacturer faced a delay in production. He had planned individual motor drives on his machines, but he couldn't corral enough motors. And if he got them, installation-time loomed ahead as another delay.

Group drives from lineshafting were the natural solution. And the natural choice for mounting them . . . Fafnir Double Ball Bearing Hanger Boxes from the nearby Fafnir distributor. Fafnirs because they're easiest to install; locked to stock shafts with a simple finger-twist of the Self-Locking Collar. Fafnirs because they pack extra radial and thrust load capacity into their Balanced Design; deeper races, larger balls.

Thus installed, these lineshafts were ready to run "for the duration"; carry maximum power from motor to machine 24 hours a day, with occasional greasings the only attention needed.

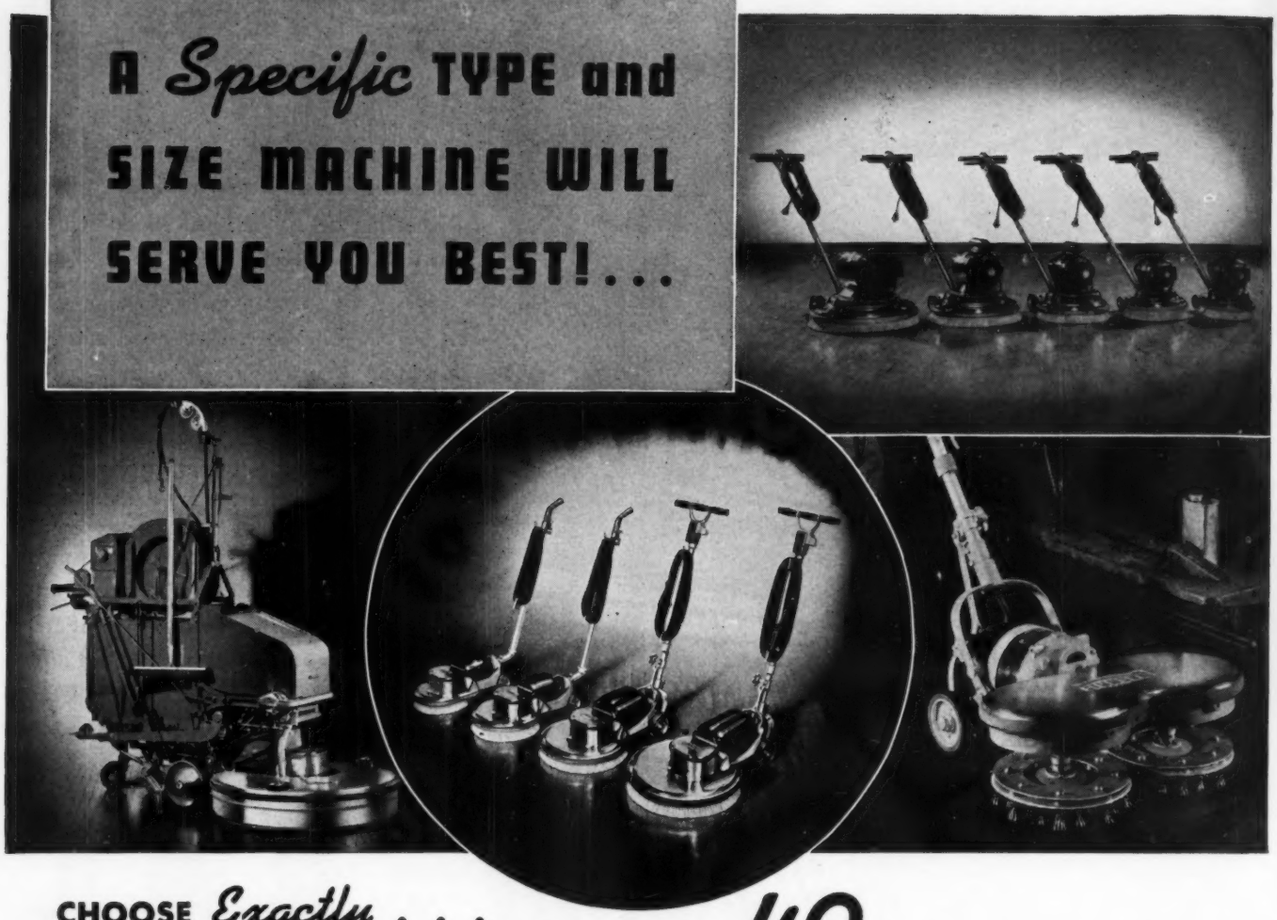
Many a defense manufacturer is taking this same road today, at the "Turning Point of increased production". And many have reason to be glad the turning point is behind them . . . the Fafnirs already spinning friction-free in their plants. The Fafnir Bearing Company, New Britain, Connecticut.

"TURNING POINT OF INCREASED PRODUCTION"

FAFNIR
Ball Bearings
THE BALANCED LINE
MOST COMPLETE IN AMERICA

FOR *Your* JOB OF FLOOR-MAINTENANCE

A *Specific* TYPE and SIZE MACHINE WILL SERVE YOU BEST!...



CHOOSE *Exactly* . . . FROM *Finnell's* 49 MODELS AND SIZES!

Finnell machines range from the compact little *Household Scrubber-Polisher* to the *Combination Scrubber with 31-inch brush spread,* designed to speed up and cut the cost of cleaning large open-area floors . . . a selection that meets the varied needs of all the industries served. Included in the complete *Finnell* line are:

The New 600 Series Motor-Weighted Finnell, with new *feather-touch* safety switch. This model polishes, waxes, scrubs, steel-wools, sands, and grinds. Comes in five sizes. (Shown in upper right-hand illustration.)

The 100 Series Finnell. Here's the Scrubber-Polisher-Waxer that's *two sizes in one!* An interchangeable brush ring adjusts the larger sizes for small areas. Low offset design . . . gets into the hard-to-reach places, around and beneath low-set furnishings and fixtures. *Noiseless,* too! Four sizes, as shown in center illustration.

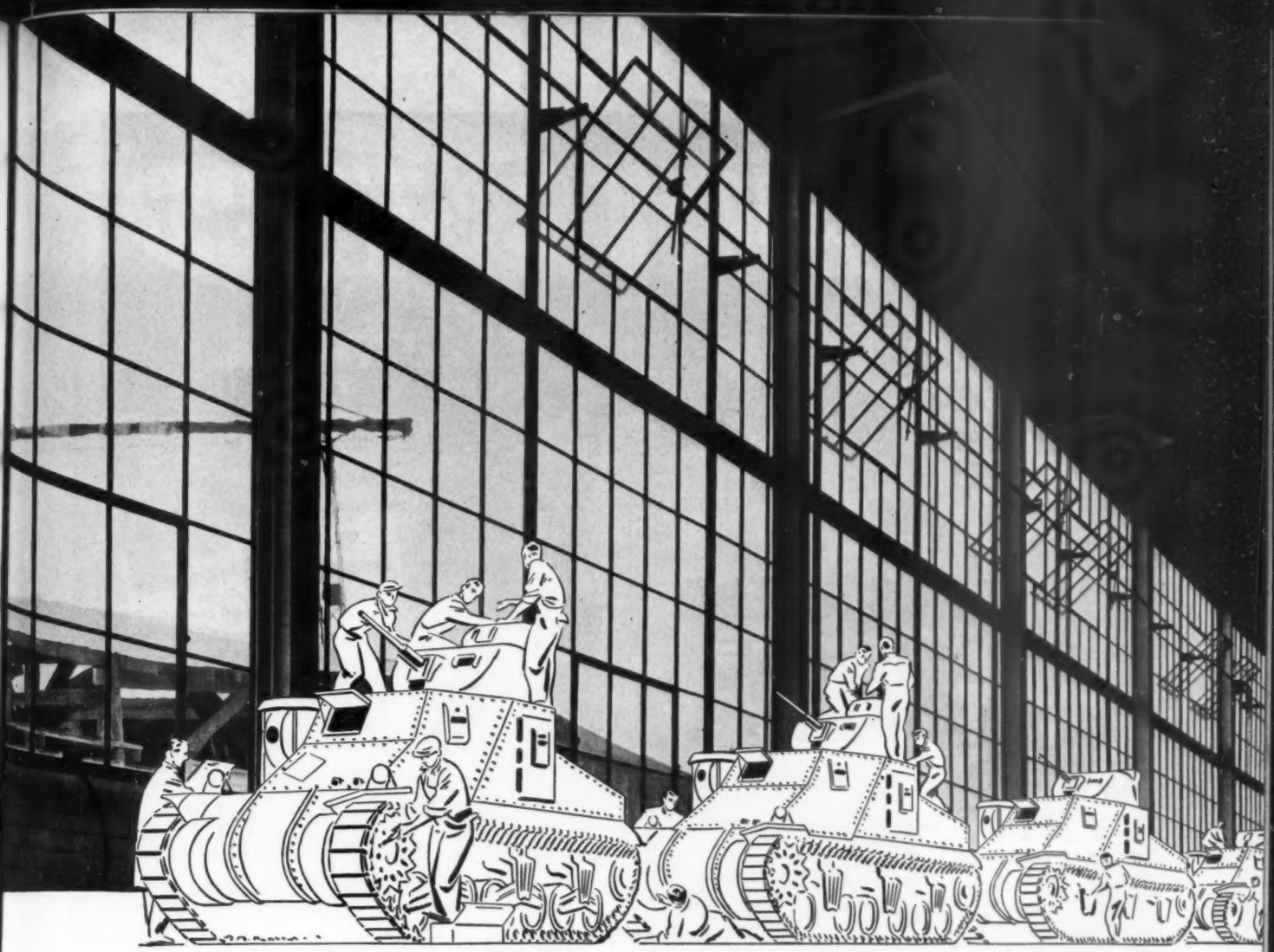
The 400 Series Finnell (left-hand illustration), a *Combination Scrubber* that does the complete cleaning job,— scrubs, rinses, and dries the floor. Three sizes. Other *Finnell Combination Scrubbers* include the *500 Series* (two sizes), a compact model for congested as well as more open-area floors.

Shown in lower right-hand illustration is the *Finnell 84-XR Industrial Dry Scrubber* for hard-to-clean floors. Also adaptable to wet scrubbing, steel-wooling, waxing, and polishing.

There's a *Job-Fitted Finnell* for *your* job! See what it will save you! For free demonstration on your own floors, phone nearest *Finnell* branch, or write Finnell System, Inc., 2512 East St., Elkhart, Ind.

FINNELL SYSTEM, Inc.

Pioneers and Specialists in FLOOR MAINTENANCE EQUIPMENT



WINDOWALLS FOR SPEED

WINDOWALLS FOR ECONOMY

• When the Windowalls for your Defense Plants are built in Fenestra's Detroit Factory, WEEKS AND MONTHS ARE SAVED in building time. Fenestra Steel Windows are delivered to your job . . . prefabricated, already fitted, assembled, prime-painted, COMPLETE.

• You can save money in 5 ways with a properly FENESTRATED Defense Plant. You'll effect very real savings over other designs (1) In building construction costs. (2) In building equipment costs. (3) In plant operating costs. (4) In plant maintenance costs. (5) In post-emergency conversion costs.

* * *

. . . For the latest complete catalog information, also engineering data on Airation and Daylighting, mail the coupon below. For quick catalog information, see the Fenestra Blue Book in SWEET'S (32nd consecutive year).

Fenestra

STEEL WINDOW SYSTEMS FOR INDUSTRY

PREFABRICATED WINDOWS • DOORS • ROOF DECK

Detroit Steel Products Company, Dept. FM-12,
2258 East Grand Blvd., Detroit, Mich.

Please send me the latest Fenestra publications, as checked:

☐ Industrial Airation ☐ Industrial Daylighting
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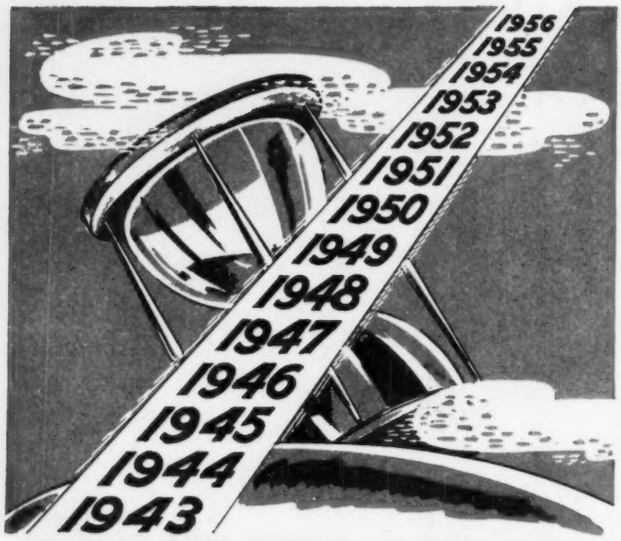
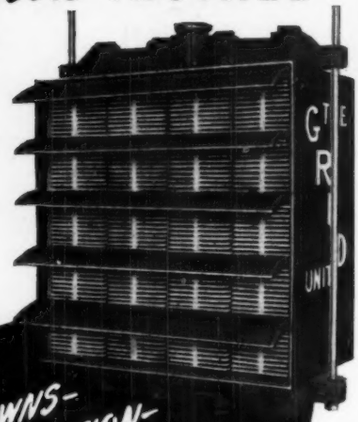
☐ Holorib Steel Roof Deck
☐ Industrial Defense Buildings Bulletin.

Name_____

Address_____



THE YEARS AHEAD DEMAND THAT YOU *Now* INSTALL GRID UNIT HEATERS



Now you can afford the ultimate in unit heater quality. Perhaps that will not be true a few years hence.

NO LEAKS OR BREAKDOWNS— STEADY OPERATION— NO MAINTENANCE EXPENSE

Grid Unit Heaters will give you years and years of dependable service—long after their initial cost has been written off your books. Grid Units now 13 years old are operating as efficiently as the first year. We have yet to replace an original installation. In Grid Units there is only one type metal in contact with steam or hot water. There is nothing to cause electrolysis that produces corrosion—*cast aluminum heating sections.* Complete details upon request.

The Unit Heater and Cooler Division

D. J. MURRAY MFG. CO.

WAUSAU, WISCONSIN

Offices in All Principal cities.

GRID UNIT HEATER

QUALITY Plus ECONOMY Victoria TOILET TISSUES

NOW AVAILABLE IN BLEACHED OR UNBLEACHED

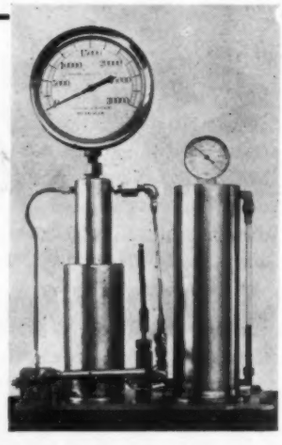
Fine tissues that meet the requirements of industrial plants, offices and institutions as to price and quality. Made by craftsmen with 60 years paper-making experience. Leading Paper Merchants sell VICTORIA tissues.

The Victoria Paper Mills Company

FOUNDED 1880. FULTON, N. Y.

30,000 POUNDS TEST PRESSURE

when and where you want it!



For quickly and accurately testing gauges . . . pressure vessels . . . castings . . . high pressure hose, etc.—either in plant or field—this Martin-Decker Rapid Pressure Booster meets your needs.

Completely self-contained—has *no* gears, *no* motors, *no* delicate parts. Model shown reads to 30,000# sq. in.—produces up to 55,000# sq. in. pressure—quickly and easily, by a simple hand operation. *And this pressure can be maintained constantly or released instantly, as desired.* Gives a positive, accurate pressure test on a wide range of hydraulic equipment such as used on aircraft. Can be operated as a portable unit in the field, or as a stationary unit on the test bench, by anyone familiar with testing devices.

Built in sizes to deliver any reasonable pressure required—in any desired scale. Quickly available from factory. Martin-Decker also manufactures an Automatic Pressure Booster for plant installation. *Write now, briefly describing your pressure testing problem!*

MARTIN HOME OF THE WEIGHT INDICATOR **DECKER CORP.**

LONG BEACH, CALIFORNIA

SAN JOAQUIN VALLEY: A. F. McQUISTON, BAKERSFIELD, CALIFORNIA
MID-CONTINENT DISTRIBUTOR: REED ROLLER BIT COMPANY, HOUSTON, TEXAS

WALKER-TURNER RADIAL DRILL

Jacobs Chuck: ½" capacity or No. 1 Morse Taper.
Spindle Speeds: four—from 600 to 5000 r.p.m. with 1740 r.p.m., motor. Eight speeds—from 600 to 10,000 r.p.m. with two-speed 1740—3500 r.p.m. three phase motor with push-button control.
Overall Dimensions: height 72", width 31", depth 58"
Shipping weight 450 lbs.
Ball Bearing Mounted: sliding ram carried on 8 precision ball bearings with provision for take-up for wear.
Six-Spline Spindle: four precision ball bearings. Drive pulley straddle-mounted to eliminate belt strain.
Capacity: to center of 62" circle. Distance nose of chuck to table 13½". Traverse of spindle 3¾". Column diameter 3¾".
Miscellaneous: drill may be tilted to 45° right or left. Drill press head cast in one piece. Run-out accuracy guaranteed within all industrial standards. Extremely rigid when locked in drilling position. Minimum deflection.

• PROMPT DELIVERY to plants engaged in defense production

Versatile, speedy, accurate—Walker-Turner Radial Drills have made themselves indispensable to many Defense industries—aircraft, shipbuilding, tank manufacturing, tool making, and etc. In the interests of National Defense, first consideration in delivery necessarily is given to high priority ratings. Immediate shipment of these Radial Drills is made to concerns engaged in Defense production. However, our enlarged facilities and three-shift manufacturing schedule enable us to make reasonably prompt shipment to plants with low priority ratings.

SEND FOR NEW WALKER-TURNER CATALOG

WALKER-TURNER CO., INC.
33121 Berckman Street, Plainfield, N. J.

☐ **Send complete details on Radial Drill**
☐ **Send complete Machine Tool Catalog**

Name ..... **Title** .....
Company .....
Street .....
City ..... **State** .....

walker-Turner
COMPANY, INC.
PLAINFIELD, N.J.
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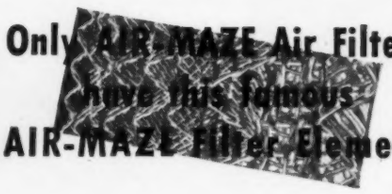
WALKER-TURNER MACHINE TOOLS
FOR METAL, WOOD AND PLASTICS

DRILL PRESSES · BAND SAWS · BENCH SAWS · TILTING ARBOR SAWS · LATHES
JIG SAWS · RADIAL SAWS · RADIAL DRILLS · BELT AND DISC SURFACERS · JOINTERS
SPINDLE SHAPERS · GRINDERS · FLEXIBLE SHAFT MACHINES · CUSTOM BUILT MOTORS

NO PRIORITIES ON ENGINE WEAR!

WEAR is still unrestricted..it continues regardless of material shortages. Now, more than ever before, you need the positive protection of AIR-MAZE Air Filters to make your present equipment LAST LONGER.

Only AIR-MAZE Air Filters have this famous AIR-MAZE Filter Element



Reduce Abrasive Wear with this

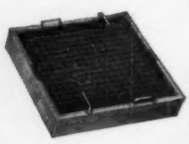
OIL BATH TYPE

Removes more than 99% of abrasive dust and grit, with less than 1.5" H_2O pressure drop. Will not clog. Easily installed on engines, compressors, blowers, etc. Automatic oil bath action constantly cleans filter element.

An Effective Spark Arrester and Air Filter

UNIMAZE TYPE

A highly efficient viscous-coated filter designed for smaller applications, such as automotive, aircraft and marine. Easily installed. Quickly cleaned. U. L. approved spark arrester. Only ⅛" H_2O restriction.



"Trap" Dust, Moisture, Paint, Oil with

PANEL TYPES

Permanent – need no replacement. Easily cleaned and recharged. All metal construction. Fire resistant. Highly efficient–99.83%. Low restriction. Made in various models for diverse applications–from air-conditioning to paint spray booths. In all reasonable sizes and shapes to fit existing frames.

Eliminate Objectionable Intake Noises with

FILTER-SILENCER TYPE

More than a silencing device "added on" to a filter. Highly efficient accoustical chamber is integral part of filter. Effectively eliminates objectionable intake noises–at same time provides 99% *plus* air filtering efficiency. Available with oil bath *or* viscous type filter element.

It's always good business to give your equipment the best of care—to get maximum service with the minimum of maintenance. TODAY, it's even more important. Your engines, compressors and blowers will have to *work harder* and *last longer* if America's "all out" program is to succeed.

Good Air Filter protection is just as essential as good lubrication in preserving your equipment at peak efficiency. Abrasive dust and grit, entering the air intakes, can quickly impair performance, cause unnecessary overhauls, create costly delays and shorten the life of any precision equipment.

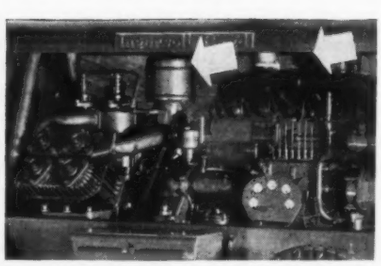
And when you specify, be sure it's AIR-MAZE—the patented, all-metal air filter providing higher air filtering efficiency with extremely low pressure drop—scientifically designed to utilize the baffle impingement principle in its highest degree.

Made in a wide range of sizes, shapes and capacities to solve nearly every air filtering problem. For further information, without obligation, write us direct.

AIR-MAZE CORPORATION

5200 Harvard Ave. • Cleveland, Ohio

THIS PORTABLE *engine-driven compressor is doubly protected by AIR-MAZE. Both air intake of compressor and engine are equipped with AIR-MAZE Oil Bath Type Air Filters, shown by arrows.*



AIR-MAZE

DEPENDABLE AIR FILTERS FOR EVERY APPLICATION

LYON
SHOP AND STORAGE EQUIPMENT

SPEEDS

VITAL NATIONAL DEFENSE PRODUCTION

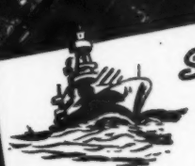
● Manufacturers of all types of Defense Products are finding Lyon Shop, Storage and Toolroom Equipment major aids in meeting or *bettering* "impossible" production schedules. By providing more orderly storage, and accelerating the handling of tools and materials, these industry-proved units permit maximum use of minimum inventory . . . conserve floor area . . . make every available die and small tool more productive.

If your defense projects involve sub-contracting of units or parts of units fabricated from heavy and medium gauge sheet metal, investigate the unusual facilities available for such work in our two large, modern plants. Illustrated brochure, "CRAFTSMEN IN NATIONAL DEFENSE" describes these facilities in detail.

LYON METAL PRODUCTS, INCORPORATED
General Offices: 1212 Madison Ave., Aurora, Ill.
Branches and Distributors in All Principal Cities

Aircraft: Pictured here is one of the many applications of Lyon Steel Shop Equipment that has helped aircraft manufacturers solve urgent and complex storage and material handling problems. Lyon Equipment is serving practically every major manufacturer of aircraft and aircraft motors in America.

Tanks: As manufacturers divert production facilities to vital defense equipment, they have turned to Lyon not only for increased amounts of the Storage and Shop Equipment used successfully for many years, but for engineering co-operation in the layout of stockrooms, toolrooms, etc., for new plants, and in solving new storage and stock handling problems.



Shipyards: In 18 leading shipyards Lyon Steel Storage and Shop Equipment is making possible faster handling of tools and materials. Strength, flexibility and space-saving design are major factors in the preference shown for Lyon Products by operators in this field.

NON-ENGINEERED DEFENSE PRODUCTS SOLD BY LYON DISTRIBUTORS

Ordnance: Arsenals and power plants —they are faced with the same common problems of SPEED. In each case, LYON Equipment is helping provide that vital speed . . . and has been readily adapted to each plant's individual requirement.

LYON *Service*
SHOP EQUIPMENT

Does shortage of raw materials threaten your business?

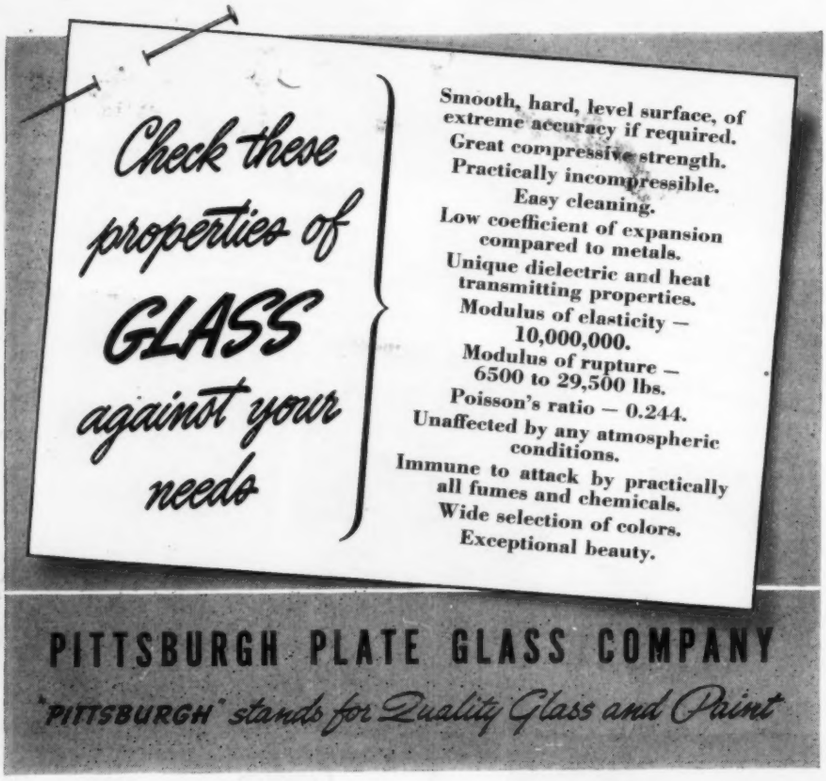
Newly-developed strength and versatility of flat GLASS may answer your problem!

IF your business is suffering from a shortage of essential production materials, perhaps you can find the answer to your troubles in *glass*.

Already, flat glass products, in a wide variety of shapes and forms, have proved themselves fully capable of replacing various defense materials in applications of many kinds. For glass today is a different material from what it used to be. New developments have given it far greater strength, resistance to shock, elasticity, and sales appeal due to a wide variety of colors.

Perhaps the substitution of glass in your product or equipment may be thoroughly practical, may even result in an actual improvement in saleability or efficiency.

We invite you to submit your shortage problem to our technical development department, and let us help you find a way to solve it with glass. There is no obligation involved. Write us on your letterhead. Address Pittsburgh Plate Glass Company, 2036-A Grant Building, Pittsburgh, Pa.


Check these properties of GLASS against your needs
Smooth, hard, level surface, of extreme accuracy if required.
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Practically incompressible.
Easy cleaning.
Low coefficient of expansion compared to metals.
Unique dielectric and heat transmitting properties.
Modulus of elasticity — 10,000,000.
Modulus of rupture — 6500 to 29,500 lbs.
Poisson's ratio — 0.244.
Unaffected by any atmospheric conditions.
Immune to attack by practically all fumes and chemicals.
Wide selection of colors.
Exceptional beauty.
PITTSBURGH PLATE GLASS COMPANY
"PITTSBURGH" stands for Quality Glass and Paint

THE GREATEST OPPORTUNITY IN A HUNDRED YEARS

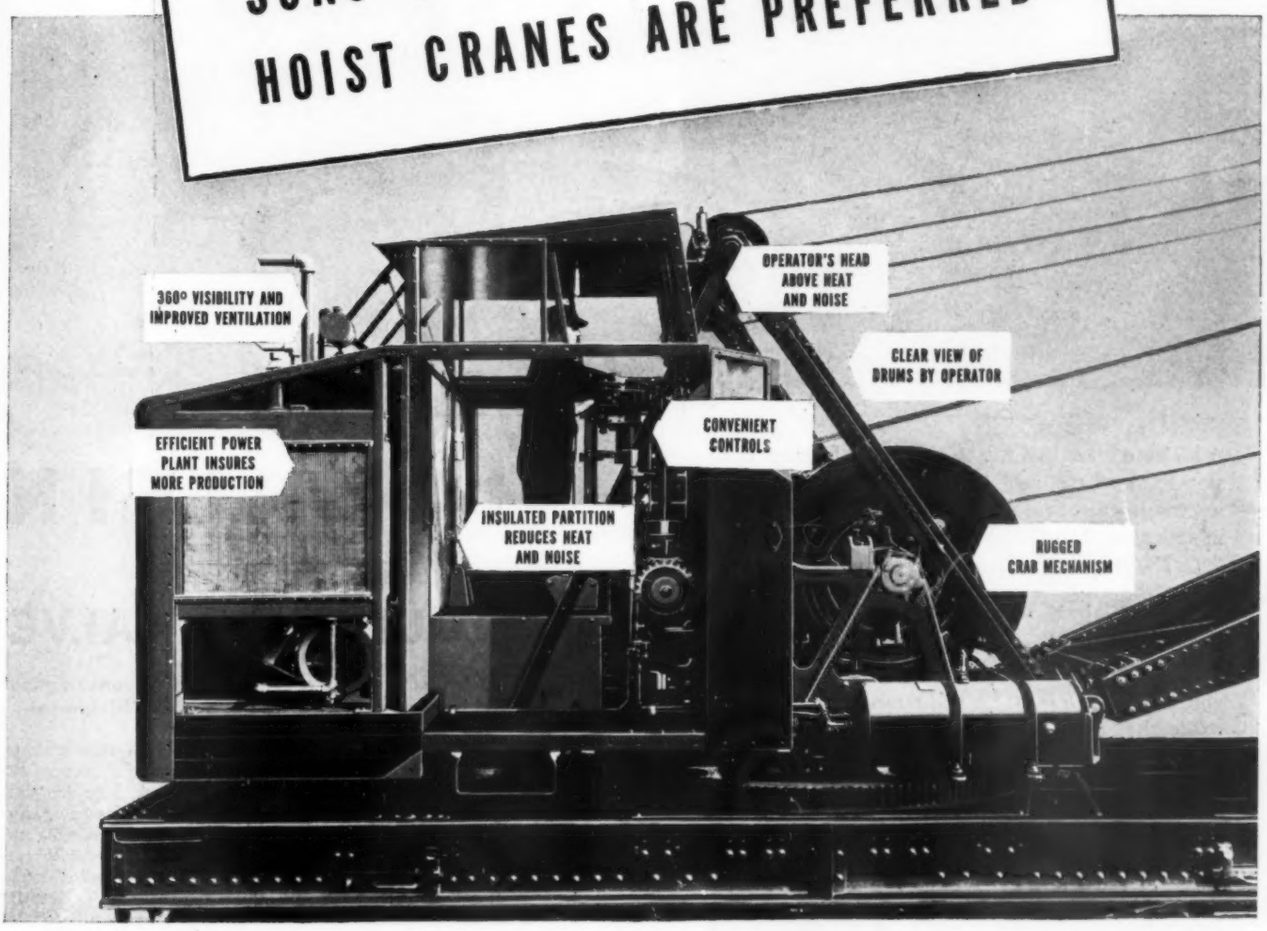
It has been predicted that the average level of business will reach the highest production point of a hundred years. What an opportunity for engineers and executives to promote the health, comfort and efficiency in business, commerce and industry! What an incentive to visit the 7th International Heating and Ventilating Exposition—the Air Conditioning Exposition—at Philadelphia in January!

Never before was there so much to be learned about modern heating, ventilation and air conditioning—never a greater opportunity to apply knowledge with profit to the Nation and self at the same time!

Visit this Exposition to check up on your ability to decide pressing problems with the assurance that can come only of knowledge confirmed and brought up to date. There is no quicker, surer, better way to conserve your time, find what you need, safeguard investments in heating and ventilating and air conditioning equipment, promote the morale and efficiency of employees, serve your Country and guard your future. Plan now —definitely—to attend with your associates.

777-B

THERE ARE PLENTY OF REASONS WHY INDUSTRIAL BROWNHOIST CRANES ARE PREFERRED


360° VISIBILITY AND IMPROVED VENTILATION
OPERATOR'S HEAD ABOVE HEAT AND NOISE
CLEAR VIEW OF DRUMS BY OPERATOR
CONVENIENT CONTROLS
EFFICIENT POWER PLANT INSURES MORE PRODUCTION
INSULATED PARTITION REDUCES HEAT AND NOISE
RUGGED CRAB MECHANISM

A glance at this model No. 4 or 5 Industrial Brownhoist Crane with Monitor-Type Cab (powered with either gasoline or diesel engines and available in 20 or 25 ton capacities) reveals a few of the many reasons why Industrial Brownhoist cranes do a better, faster job of material handling.

360° visibility enables the operator to see clearly in every direction—with no effort whatsoever.

The insulated partition between the motor and the rest of the cab greatly reduces noise and heat in the operator's compartment.

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In fact, from every standpoint, the Industrial Brownhoist cranes of today are designed and built to insure longer crane life, lower costs and greater efficiency.

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GENERAL OFFICES: BAY CITY, MICHIGAN • DISTRICT OFFICES: NEW YORK, PHILADELPHIA, PITTSBURGH, CLEVELAND, CHICAGO

A blasting blaze in a dip tank; a roar of flames in a storage room; the quick blistering heat from a burning transformer fire; ALL these FIRES can be killed in split seconds when your plant is protected with a C-O-TWO* Fire Extinguishing System.

IT'S SAFER *because* IT'S FASTER

No mess or mopping-up or shut down from water and fire axes. C-O-TWO is harmless to equipment and materials. Industry now knows that carbon dioxide, the fastest fire extinguishing agent known to man, can smother a smoldering fire before it flames, and in a few seconds kill a raging oil or electrical fire.

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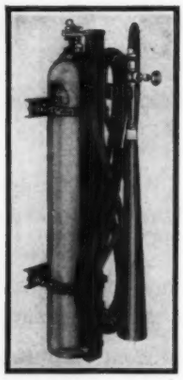

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***DEPENDABLE* pressure regulation cuts air consumption and improves operation of pneumatic equipment**

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Furnished complete with pressure gauge.

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Efficient and economical plant operation is vital to attain the unprecedented production levels demanded by the National Defense program.

The dependability and long life built into every GARLOCK quality product today, as always, contributes to efficient plant operation by reducing production time losses due to shut-downs for frequent replacement of packings and gaskets.

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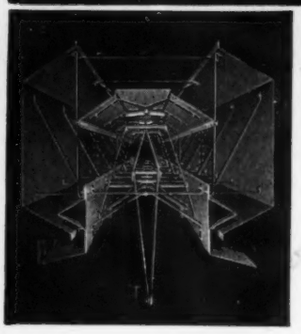

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For Better, Faster, More Accurate Production...

Meet Your Job Requirements With CENTURY MOTORS

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Call in your nearest Century Motor Specialist and find out how Century Motors that are engineered for each job may help speed production in your plant, too.

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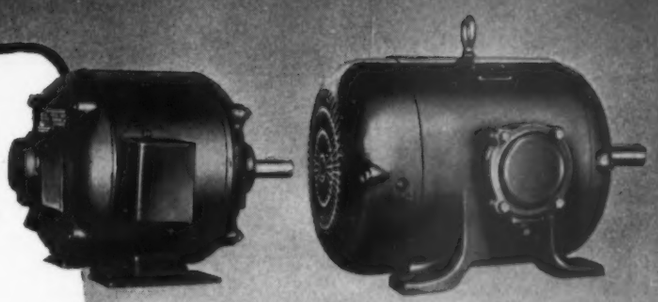
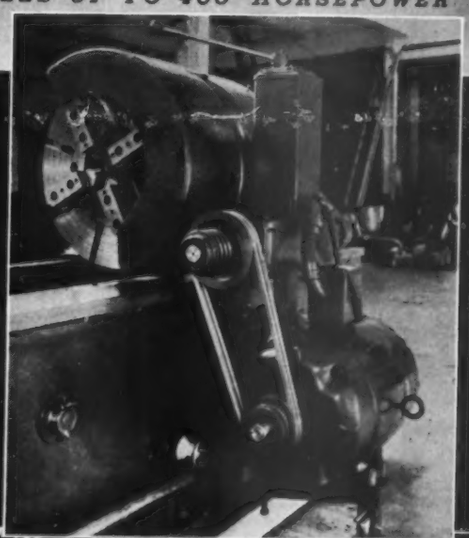
Offices and Stock Points in Principal Cities

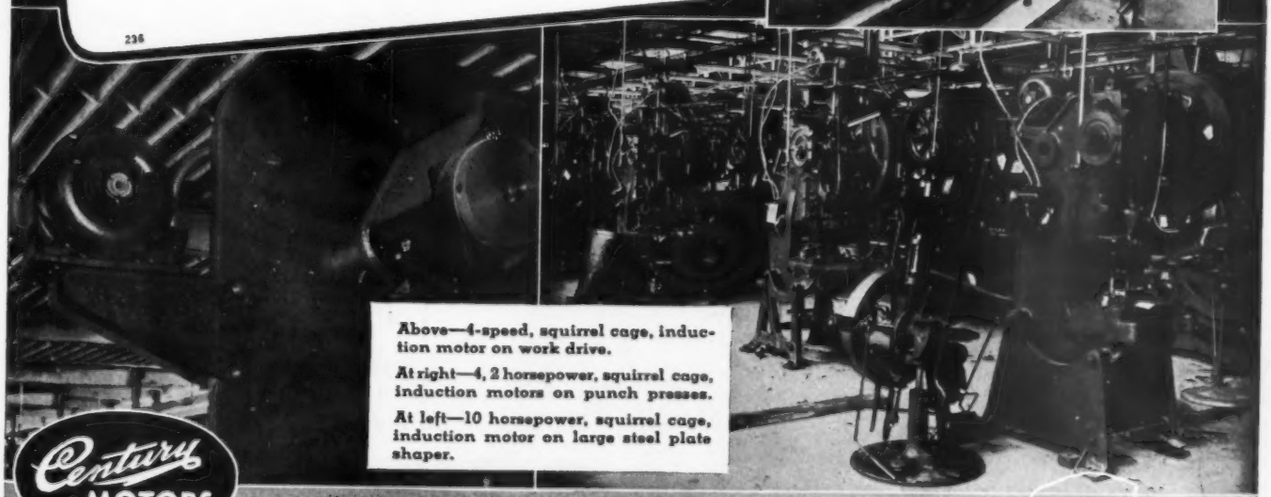


½ horsepower, squirrel cage induction motors.

15 horsepower, squirrel cage, totally enclosed fan cooled induction motors.

SIZES UP TO 400 HORSEPOWER





Above—4-speed, squirrel cage, induction motor on work drive.

At right—4, 2 horsepower, squirrel cage, induction motors on punch presses.

At left—10 horsepower, squirrel cage, induction motor on large steel plate shaper.

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Figuring 10,000 "kicks" on a treadle with a four-inch stroke, the operator of an ordinary power press literally hops two or three miles during an eight hour day.

The installation of a Schrader Air-Operated Foot Pedal streamlines press operation down to tip-toe action. The Schrader Pedal moves only 4/5ths of an inch. An operator can sit comfortably and never lift his heel off the floor. The results are a more constant output, which increases production, plus a higher quality of work with less spoilage. Safety is another important benefit.

By lessening fatigue, the possibility of accidents is reduced.

Schrader Pedals come in complete sets, which your own men can easily install on power presses, kick presses, shears and drop hammers. Or, they may be had separately for your own hook-ups. Order through your local supply house, or write for name of nearest Schrader Distributor.

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Air-Operated
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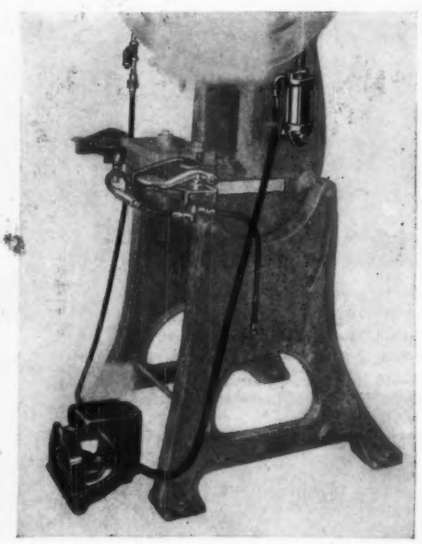

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Do you realize that leading equipment and materials manufacturers conduct a perpetual equipment show for you every month in the advertising pages of FACTORY?

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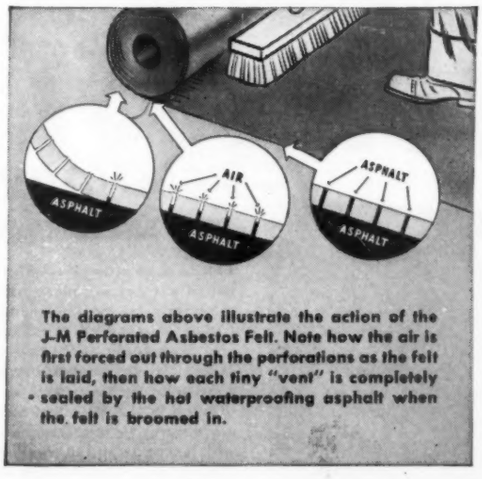
YOU MEAN THESE HOLES MAKE A BETTER ROOF?



The diagrams above illustrate the action of the J-M Perforated Asbestos Felt. Note how the air is first forced out through the perforations as the felt is laid, then how each tiny "vent" is completely sealed by the hot waterproofing asphalt when the felt is broomed in.

YES! **New J-M Perforated Felts practically eliminate blistering, cut application costs, provide the time-tested advantages of all J-M Asbestos Felts**

Punch holes in a roofing felt? Doesn't sound right, does it? But read what these holes actually do . . . see how they help raise the efficiency of built-up roofs to new highs!

Plant engineers agree that the perforations in the new J-M Felts speed up application . . . cut costs. They find that these perforations act as "check valves." When the roof is laid, they permit trapped air to escape, yet are completely sealed by the waterproofing asphalt. Result: J-M Perforated Felts adhere tightly to each other and to the roof deck . . . effectively prevent troubles often caused in ordinary roofs by blistering.

And remember—this J-M Felt is an *asbestos* material . . . fireproof, rotproof, weather-resistant! Let the facts show why it gives you more for your roofing dollar. Write Johns-Manville, 22 E. 40th St., New York, N. Y.

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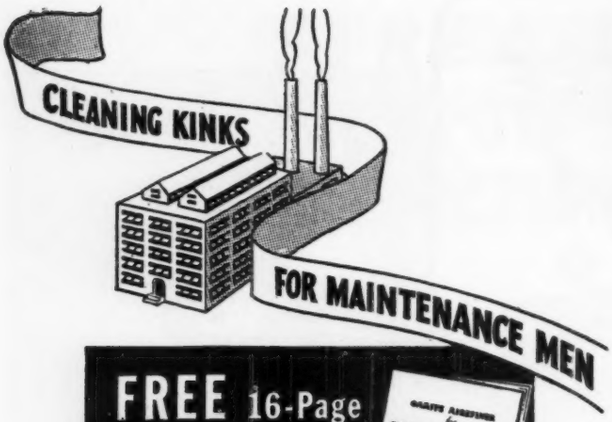
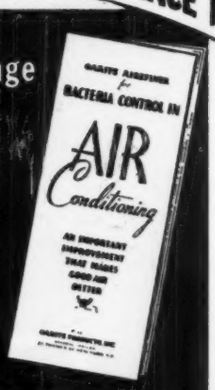
Smooth-Surfaced ASBESTOS BUILT-UP ROOFS

THE ROOF WITH THE SAFETY FACTOR



FREE 16-Page BOOKLET Tells How to Clean DIRTY AIR FILTERS *quickly, at low cost!*



HOW would you like to clean your dust-laden air filters better, easier . . . do this important maintenance work quickly, and at a big saving in money? Then you will want this fact-filled, 16-page booklet for ready reference and use! It describes tested, proved Oakite materials and methods that are so successfully helping maintenance men the Nation over make worthwhile economies on this job.

Whether it is cleaning dry or viscous type filters, conveyor type filters or stationary filter banks . . . the booklet gives details on an Oakite material and method expressly designed for cleaning each type that THOROUGHLY and SPEEDILY remove dirt and grime . . . economically restore units to the full filtering efficiency you want!

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OAKITE *Certified* **CLEANING**

MATERIALS & METHODS FOR EVERY CLEANING REQUIREMENT

This Jack Uses Its Head To Save Your Money!

- Lifts on cap
- On adjustable shoe that engages in cap
- On grab hook end chain, any link of which engages in recess in cap

It's right on its toes, too—corrugated non-slip toe lift will handle full rated capacity of jack. This Simplex Emergency Jack is the most practical and versatile jack available. Tilts on its base for jacking at an angle. Operates in horizontal position for jacking or pushing. Has double lever socket for jacking in close quarters. Cuts costs on rigging, plant maintenance, erection and countless other jobs.

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DURABLE
ADAPTABLE
AVAILABLE

THE IMMEDIATE ANSWER TO YOUR FLEXIBLE CONNECTION PROBLEMS! ***Ask for Complete Data on***

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Sizes from ⅛" I.D. Pressures to 14,500 p.s.i. Temperatures to 1000° F. One-piece, all-steel construction. Continuous lengths to 50 feet.

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Sizes from ½" I.D. Asbestos packed.

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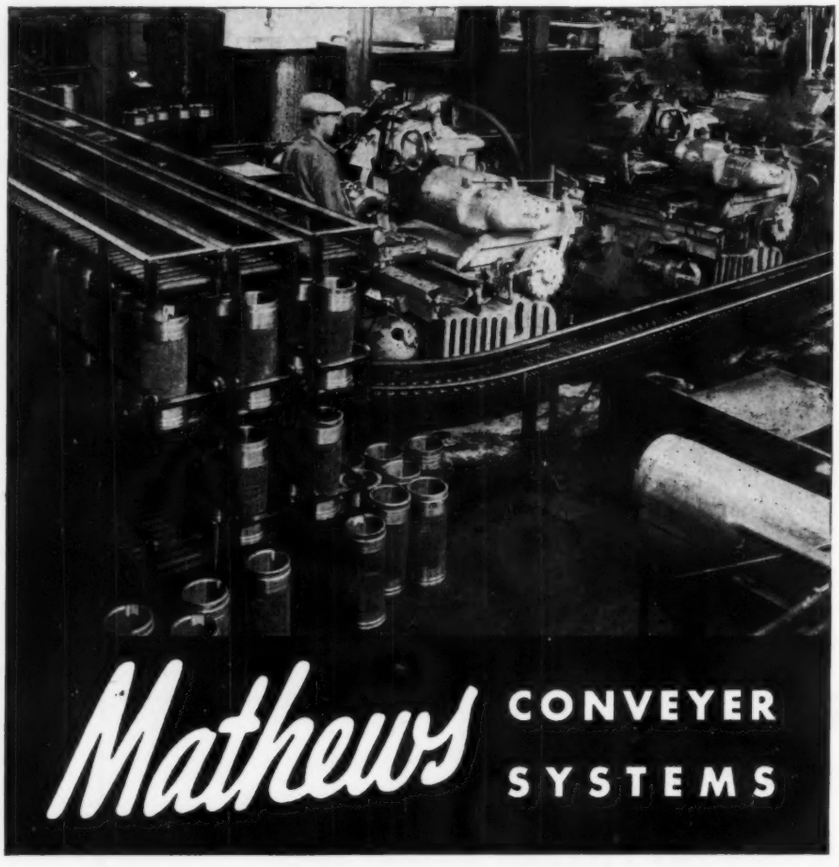
QUICKLY—ECONOMICALLY



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Multiple-Shift Operation
Twenty-Four-Hour Maintenance
Planning and Scheduling
Work Simplification
Training Operators and Foremen
Rating Jobs and Men
Safeguarding Health
Insuring Plant Protection
Employee Identification

Get a copy for yourself, yes. But get, also, copies for all your key men. Good ideas are valuable wherever you find them. And these case stories are inspiring

★

1 to 9, $1 each; 10 to 24, 90¢ each; 25 to 49, 80¢ each; 50 to 99, 70¢ each; 100 to 249, 60¢ each; 250 or more, 50¢ each. All f.o.b. Albany, N. Y., except single copies, which are postpaid.

MAIL THIS COUPON

Editor, Factory,
330 W. 42nd St., New York, N. Y.

Send me ——— copies of "How to Get More Production" @ ——— each, plus shipping charges (single copies are postpaid).

Name .....

Address .....

City and State .....

How "Better Handling Betters Profit"

For more than 20 years, FACTORY's editors have been telling readers how better Materials Handling equipment can pay for itself in improved efficiency and reduced labor costs. Here are some of the articles which appeared in previous issues this year:

Better Handling Boosts Output —*July 1941 issue*

Delivers the Goods Automatically to 15 Working Floors—*June 1941 issue*

Storerooms on The Move—*May 1941 issue*

No Man-Made Movers Here—*April 1941 issue*

Wiped Out a Bottleneck to Get More Output—*March 1941 issue*

Month After Month

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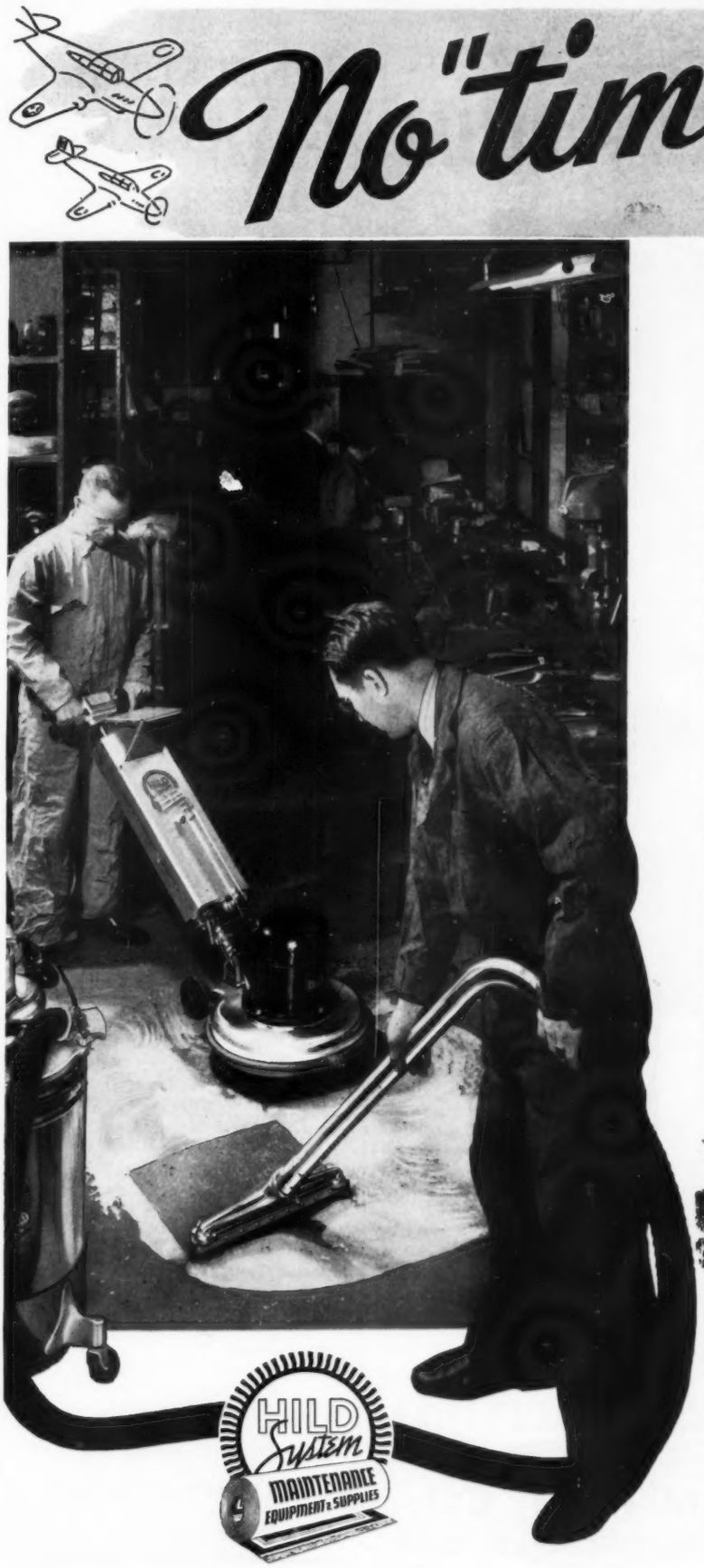
Brings You Practical Ideas On How

"Better Handling Betters Profit"

SPEED DEFENSE PRODUCTION! ★ ★

No "time out"



WHEN FLOORS ARE
(1) SHOWER FEED SCRUBBED
(2) VACUUM DRIED
by the HILD *System*

Scrub those floors between shifts . . . or even during operations! Working together in an area no more than ten feet square, two men with the HILD Floor Machine and Vacuum Pick-up cover ground quickly and leave behind them floors that are clean . . . *and dry*. No rinsing needed. Floors dry almost instantly . . . in a fraction of the time required when mopped . . . and no slick film remains. Slip-hazard is banished and accidents prevented.

HILD Equipment is designed to handle easily in crowded areas. It goes up close to machinery and cleans thoroughly. With special attachments HILD Equipment may be used to scrub or dry-clean floors of all kinds . . . cement, plank, wood-strip, wood-block, etc. The same HILD Equipment used for scrubbing floors also performs dozens of important dust-control jobs.

MAIL COUPON FOR *free* CIRCULAR

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1313 W. Randolph St., Chicago, Ill.

Gentlemen: Please send your free circular about Plant Maintenance. No obligation.

Name.....

Address.....

City.....State .....

Attention Mr.....

SUB-CONTRACT

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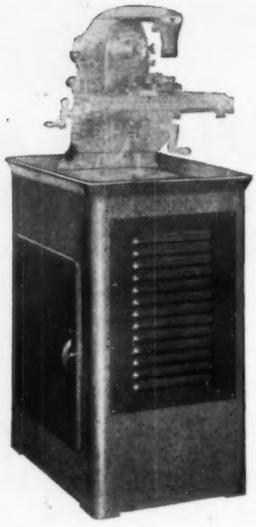
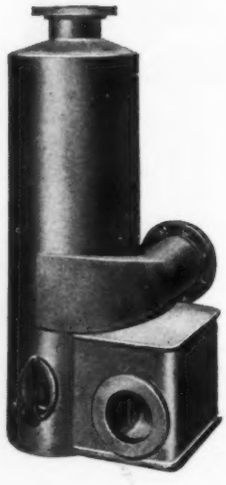
KIRK & BLUM





Save time and worry—meet urgent deliveries by subcontracting your sheet metal parts to Kirk & Blum.

We are equipped to design, manufacture and assemble sheet steel jobs with maximum speed at a minimum cost.

Many manufacturers have found Kirk & Blum Service pays an extra profit, by releasing men, machines and valuable space needed for other important work.

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INDUSTRIAL CONSULTANTS

ASSOCIATED ENGINEERS, INC.
Management Consultants
Engineering—Accounting
Organization—Methods—Costs
Old-First Bank Building, Fort Wayne, Indiana

METHODS ENGINEERING COUNCIL
MOTION AND TIME STUDY INDUSTRIAL MANAGEMENT
INSTRUCTION CONSULTATIONS
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Wood and Franklin Streets, Station 21
Pittsburgh, Pa.

ALLAN H. MOGENSEN
Training in Work Simplification
330 W. 42nd Street
NEW YORK CITY

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FACTORY MANAGEMENT *and* MAINTENANCE
330 West 42nd Street, New York City

"YEAR AFTER YEAR THE SAME NAMES ON OUR ORDER BOOKS WOULD INDICATE THAT THEY'RE SATISFIED WITH PHILADELPHIA GEARS"

Philadelphia
LIMITORQUE
CONTROL
operates all types of valves, etc., safely, economically, from convenient stations.
Philadelphia
WORM GEAR
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right angle drives—vertical or horizontal. Wide range of ratios and horsepowers.
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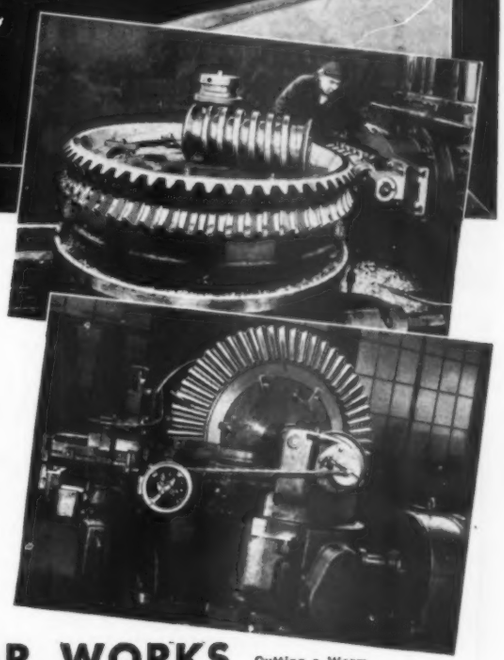
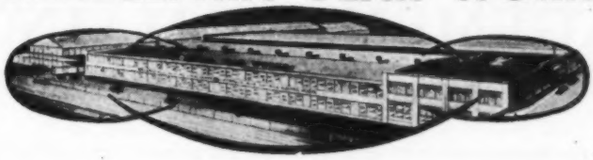
Philadelphia
MotoReducer
The economical self-contained drive. Horizontal or Vertical types—various ratios and horsepowers.
Philadelphia GEARS
All types and sizes of industrial gears. Can be supplied in all materials.



Repeat orders usually are not just accidents . . . they're the result of a buyer's getting real satisfaction from a quality product that came up to his expectations. We know this to be true. That's why we are so proud of the orders that keep coming from firms to whom for years we've been supplying gears of all types. Yes, we are equipped to turn out every kind of industrial gear . . . large and small and in all available materials. If you're in the market for gears . . . start now to know REAL SATISFACTION . . . call on Philadelphia. Write today for more information.

Cutting a Worm Gear and a Bevel Gear

PHILADELPHIA GEAR WORKS



Industrial Gears and Speed Reducers

Erie Ave. and G St.
Philadelphia, Pa.

New York - Pittsburgh - Chicago

"WHAT CAN IT DO FOR ME?"

Advertising that is read with this thought in mind, may provide the solution to a problem that has kept you awake nights for weeks. Remember, back of the signature of every "Factory" advertiser is another organization, whose members have thought long and hard about your business in the course of introducing and applying their products or services to your industry.

If their offerings can improve the quality of your company's product . . . or save your company's money . . . they can contribute to your company's income.

We all know, "It pays to advertise". It pays just as big to investigate *what is advertised!*

Each month, Factory Management and Maintenance's advertisers, old and new, invite you and over 29,000 other subscribers to investigate further the advantages they can provide.

FACTORY
MANAGEMENT & MAINTENANCE

WHERE TO BUY

Featuring additional products and specialties for manufacturing plants

Needs NO STARTING HOLE for INSIDE Cutting!
You can shear a greater variety of shapes without adjustment—on a Libert. . . This Versatility means SAVINGS! Write for bulletins.
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Green Bay, Wisconsin
Libert Hi-Speed SHEAR

Morton Salt Co. Chicago, Ill.
HEAT FAG
WORKERS WHO Sweat NEED Salt
• USE MORTON'S SALT TABLETS •

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FOR TUBE, CABLE, BAR, ROD
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BURNDY
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42 Years Old
WRITE US YOUR PROBLEM
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MOVE HEAVY MATERIALS Easier!
with WELD-BILT
HYDRAULIC LIFT TRUCKS
New Horizontally-Mounted INTERCHANGEABLE Hydraulic Unit. Capacities from 2500 lbs. to 10,000 lbs. Saves time, labor, expense in ALL Materials Handling.
Write for latest bulletins.
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Est. 1878
ORANGEVILLE
Ask For CATALOG
ALL TYPES FLOOR TRUCKS WHEELS CASTERS
ORANGEVILLE MFG. CO.
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UC LEVEL INDICATOR
for 55 gallon drums
Tells the inside story of your drums at a glance. No more guessing, tapping, measuring. Simple to install and transfer. Maintains a constant check on inventory. Your supply "watch dog". Write for bulletins and prices.
U-C LEVEL INDICATOR SALES
826 N. Broadway Milwaukee, Wis.

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Tarpaulins, Covers, Canvas, plain or waterproofed by yard or roll. Canvas specialties made to specifications. Let us know your requirements. Write for general descriptive folder No. FM-1.
C. R. DANIELS, INC.
101 Crosby St., New York, N. Y.
Newark Boston Chicago, Cleveland
Buffalo Hartford Milwaukee Alberton, Md.
Detroit Philadelphia Pittsburgh

THE Where to Buy Section of Factory Management and Maintenance supplements other advertising in this issue with these additional announcements of products and services essential to modern plant management and maintenance. Make a habit of checking this page each issue.

THE PURE OIL COMPANY
CHICAGO, U.S.A.
A COMPLETE LINE OF INDUSTRIAL PETROLEUM PRODUCTS
A Pure Oil engineer will help solve your lubrication problems. Write today.
PURE
Be sure with Pure

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at your service for bringing business needs or "opportunities" to the attention of men associated in administrative, executive, management, sales and responsible technical, engineering and operating capacities with the industries served by McGraw-Hill publications:

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TOOL AND MACHINE SHOP EXECUTIVE

This opening for a competent TOOL AND MACHINE SHOP EXECUTIVE requires a man with successful tool executive experience, with extensive practical experience in the producing of accurate jigs, fixtures, cutting tools, dies, etc., and with demonstrated ability in securing cooperation and results from high type union mechanics.

The company is a well known industrial organization in the light manufacturing field, and is engaged on both its regular production and defense work.

Give details covering experience, past and present connections, age, and salary expected. Address box:

P-910, Factory Management & Maintenance
330 West 42nd St., New York City

MECHANICAL ENGINEER

wanted by large manufacturer for development, layout and cost reduction on material handling, storage, and packing problems. Desire man with good record and engineering training from accredited colleges. Experience up to 12 years. Location, north New Jersey.

U. S. CITIZENS ONLY

State experience, education, attach photo (not returnable). Box 562, Suite 1800, Times Bldg., N. Y.

INDUSTRIAL TIME STUDY ENGINEER

Age 28 to 40. Expanding industrial organization requires men with experience in job studies for cost control. Opportunity for men capable of quickly organizing and executing extensive time study program. For consideration, send snapshot and complete record — personal, education, industrial—to

P-903, Factory Management & Maintenance
330 W. 42 St., New York City

POSITIONS VACANT

INDUSTRIAL ENGINEERS. Large company engaged in non-defense work has several openings for Chief Industrial Engineers. 8 to 10 years experience in all phases of industrial engineering required. This should include organization analysis, procedural analysis, departmental layout, materials handling, motion study, time study, cost analysis, wage payments plans. Experience should be diversified, including, if possible, work in the fields of retailing, warehousing, packaging, and shipping. To qualify, applicants must possess full academic training (or the equivalent in added engineering experience) in Industrial Engineering, Mechanical Engineering, or business administration, and they should be from 30 to 35 years of age. Salary from $4200 to $6000 depending upon individual qualifications. Other openings for less experienced engineers having some of the qualifications listed above. Ages 25 to 30 years. Salary on these positions will range from $2400 to $4200 depending upon individual qualifications. You may list your present employer as replies will be held in strict confidence. Our own men know of this ad. P-905, Factory Management & Maintenance, 520 N. Michigan Ave., Chicago, Ill.

INSPECTOR with practical shop background, several years experience, 35 years old or older, qualified to assist in directing inspection work in small aircraft accessory defense manufacturing plant in Newark, N. J. P-906, Factory Management & Maintenance, 330 W. 42nd St., New York, N. Y.

POSITIONS WANTED

GRADUATE ELECTRICAL ENGINEER. Age thirty-four. Ten years experience in electrical maintenance and construction work in large industrial plant. Expert on control work. Desires position as Electrical Foreman. PW-904, Factory Management & Maintenance, 520 N. Michigan Ave., Chicago, Ill.

EXECUTIVE active in priorities work since beginning of defense program wants position to head or to organize Priorities Department. Public relations background—extensive Washington contacts. PW-909, Factory Management & Maintenance, 330 W. 42nd St., New York, N. Y.

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT : BUSINESS : "OPPORTUNITIES" : EQUIPMENT : USED OR RESALE

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15 CENTS A WORD. MINIMUM CHARGE $3.00
Positions Wanted (full or part time salaried employment only) ½ the above rates payable in advance.
Box Numbers—Care of publication New York, Chicago or San Francisco offices count as 10 words.
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The advertising rate is $8.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.

(Copy for new advertisements received by Nov. 21st for the Dec. issue subject to space limitations)

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PLANT MANAGER - SUPERINTENDENT: Thorough mechanic and seasoned executive with experience covering everything from the building and organization of a plant to the delivery of the finished product. Will interview principals only. Initial salary, $8000.00. Record and credentials of a high order. Address PW-899, Factory Management and Maintenance, 330 W. 42nd St., New York, N. Y.

PERSONNEL MANAGER, Young, College Graduate, Married, good appearance, fine personality, diplomatic, tactful. Manufacturing experience directing entire department, employing for plant, office, sales; handling all ramifications of personnel. Excellent references. Prefer Middle West or South. PW-898, Factory Management & Maintenance, 520 N. Michigan Ave., Chicago, Ill.

MANUFACTURING EXECUTIVE. Seventeen years experience in metal fabricating operations and development work. Graduate engineer with chemical engineering and industrial engineering training. Present activities will be terminated shortly. Excellent record. Present salary, $12,000. Age 40. Particularly suited to be officer or assistant to officer of industrial organization or to share management responsibilities with Owner. Reply PW-907, Factory Management & Maintenance, 520 N. Michigan Ave., Chicago, Ill.

CONTRACTING ENGINEERS

We are interested in establishing recognized firms of contracting engineers as exclusive representatives for Lindsay Structure in a limited number of industrial territories. Such concerns must enjoy a good engineering reputation and preferably should specialize in engineering and erecting small industrial buildings, machine housings, processing rooms, and similar light steel structures. We are in a position to offer the proper concerns a rather unique opportunity to broaden their scope and to obtain new business. *Write*

LINDSAY STRUCTURE DIV.
DRY-ZERO CORPORATION
Merchandise Mart Chicago, Illinois

SALARIED POSITIONS

$2,500 to $25,000

This thoroughly organized advertising service of 31 years' recognized standing and reputation carries on preliminary negotiations for positions of the caliber indicated above, through a procedure individualized to each client's personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by a refund provision as stipulated in our agreement. Identity is covered and, if employed, present position protected. If your salary has been $2,500 or more, send only name and address for details.

R. W. BIXBY, INC.
276 Delaware Bldg., Buffalo, N. Y.

Key Men For Industry

We offer an ethical personnel service to INDUSTRY as well as above average men in management, engineering and manufacturing who wish to improve themselves.

Curt E. Patton Personnel Eng'rs
53 W. JACKSON CHICAGO

EXECUTIVES AND TECHNICAL MEN

We solicit inquiries from qualified candidates who desire to contact employers for positions paying from $2,500 to $20,000 per year. Confidential. Est. 26 years.
(Inquiries from Employers entail no obligation)

THE NATIONAL BUSINESS BOURSE
H. H. Harrison, Director
20 W. Jackson Blvd., Chicago

Patented or Patentable IDEAS or INVENTIONS

• • • requiring development for production and marketing, desired by long established manufacturer of medium and heavy precision machinery.

Want items applicable to the defense program or suitable for industrial use after the emergency. Both machinery and other products lending themselves to small volume production will be considered.

Send complete details on protected ideas to:

BO-901, Factory Mang. & Maintenance
520 No. Michigan Ave., Chicago, Ill.

TIME AND MOTION STUDY for METHODS IMPROVEMENT

A thorough knowledge of Methods Work gained by the application of Motion and Time Study offers opportunities to those interested in advancement through Methods Engineering. Individual Home Study courses supervised by trained industrial consultants active in this field supply the training necessary. Personal training available for Industrial groups. Details of all courses offered described in our booklet mailed on request.

METHODS ENGINEERING COUNCIL
Wood and Franklin Streets
Pittsburgh (21) Pennsylvania

1001 ANSWERS

to questions and problems in **Time Study, Motion Study, Micro-Motion Study, Occupational Rating, Wage Incentives,** and all other phases of **Industrial Engineering,** for engineers, educators and students. Not a home-study course, but designed with ample references, for self-help in effective training. Contains lectures by eminent authorities in the profession, questions and practical problems, together with their solutions. Revised for you after four years of intensive application by the students of the practical, comprehensive training of the Industrial Ti-Mo Clinic. Comes to you in FORTY weekly installments of over 600 pages, of text, lecture, and form material. $8.00 total cost with order, or $2.00 per week for five weeks. Reserve your set today by writing to the:

INDUSTRIAL TI-MO CLINIC
4000 Washington Blvd. Chicago, Ill.

Practical evening training for Supervisors and Engineers living in the Chicago area is available.

HAVING LABOR TURNOVER?

A Simple Method of Analysing Labor Turnover Will Help.

Write for Descriptive Circular.

Industrial Relations Council
35 W. Jackson Blvd. Chicago, Ill.

—TRANSFORMERS—

TRANSFORMERS WANTED

in operating condition or burnt out. Mail us list giving complete nameplate data and stating condition.

We Rewind, Repair and Redesign all Makes and Sizes
ALL TRANSFORMERS GUARANTEED FOR ONE YEAR
Write for Catalog No. 136-D

THE ELECTRIC SERVICE CO., INC.
"AMERICA'S USED TRANSFORMER CLEARING HOUSE"
STATION M Since 1912 CINCINNATI, OHIO

SURPLUS EQUIPMENT

85—Westinghouse Mill Type Reflectors —Catalog #350496—24" Diameter Mogul Sockets—With Glass Globes taking 8" Holder—Cords and Plugs——Also some with standard sockets.
1—125 KW Skinner Slide Valve Unit.
2—Neptune Water Meters—4" Openings and 6" Openings.
1—Sharpless Separator Type MLW 8350—Item #6688.
1—General Electric 5 HP Variable Speed Motor.
2—Gas Steam Radiators.
2—Gas Meters—Large Capacity.

Collins & Aikman Corp.
Plant F, Leverington Ave. & Wilde St.
Manayunk, Philadelphia, Pa.
Telephone Greenwood 6800

What is YOUR Problem?

Competent men for your staff? . . .
Employment?
Or, are you looking for—or offering —a business opportunity of special interest to men in the industry served by this publication?

The solution of any of these problems can logically be found *first* among *other* readers of Factory Management & Maintenance. You can get their attention—at small cost—through an advertisement in the Searchlight Section of

FACTORY MANAGEMENT & MAINTENANCE

For sale by owner
HOISTING ENGINE

One Crane Elevator Company steam hoisting engine complete with drum for seven-story building. Allowable load about 2,000 lbs.
FS-908, Factory Management & Maintenance
520 No. Michigan Ave., Chicago, Ill.

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For quick disposal the following Westinghouse equipment. Newly installed in 1938 and in excellent condition:
1—Type CS ET Induction Motor Frame #772, 150 HP, 2300 Volts, 3-phase, 60 cycles, 1170 RPM.
1—Type HG Alternator Frame #6-51 x 11½, 700 KVA, 440 Volts (variable 400V to 500V), single phase, 60 cycles.
1—Type SK Pilot Generator Frame #63, 5KVA, 1160 RPM, 440 Volts, shunt wound.
1—Type SK Exciter Frame #83, 15KW, 1160 RPM, 125 volts, compound wound.
1—Generator Control Panel.
1—Motor Starting Panel
Also
1—Federal Aluminum Spot Welder.
FS-902, Factory Management & Maintenance
330 W. 42nd St., New York City

ELECTRICAL MACHINERY

Motors and Generators, A.C. and D.C. for sale at Attractive Prices. Large stock. New and Rebuilt. All Guaranteed. *Write for Stock List and Prices.*

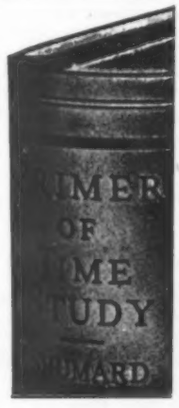
V. M. NUSSBAUM & CO.
FORT WAYNE, IND.

BARGAIN IN SPROCKETS

900 Sprockets (surplus from '41 model)—60 tooth ⅜" pitch by 3/16" case hardened steel. Immediate Delivery. Any reasonable bid for all or part accepted, or write for prices.

SALSBURY CORPORATION
1161 E. Florence Ave. . Los Angeles, Calif

Now—in one 520-page book—
A thorough, practical course in —TIME STUDY—



No need to tell you the opportunities today for competent time-study men. If you have any contact with industrial plants, you know how great is the demand for men equipped to handle time-study analysis. Specialists in the field are making enviable records.

Now we announce a thorough, practical home-study course in time study, written by an industrial engineer who has trained many specialists.

Can you install a complete time study system in another plant?

Do you know how to make use of the leisure time of operators who have available time between machine cycles?

Can you prescribe time standards or piece work prices for jobs run in combination without periodically changing rates to satisfy new combinations?

Is your present experience confined to the knowledge of one particular system?

***Read Shumard's PRIMER OF TIME STUDY.* Offers you a complete instructional course. Covers many topics of advanced time study analysis never before adequately handled in a book. Will interest experienced time-study engineers as well as beginners.**

Shumard's
A PRIMER OF TIME STUDY
520 pages, 6 x 9, illustrated, $5.00

This book assumes no previous knowledge of the subject on the part of the reader. It begins with the time the stop watch is first wound and step by step carries you through the whole procedure until overhead rates are set up and cost control is established.

Every detail is clearly, competently explained. Abundant forms, charts, tables, problems, illustrative examples, clarify the principles—show you just what to do and how to do it. Each chapter is followed by questions and problems for which definite answers are given. The introduction includes instructions for studying the book and for rating one's self on the test answers.

10 DAYS' FREE EXAMINATION — SEND THIS COUPON

McGraw-Hill Book Co., 330 W. 42nd St., N. Y. C.

Send me Shumard's Primer of Time Study for 10 days' examination on approval. In 10 days I will send $5.00, plus few cents postage, or return book postpaid. (Postage paid on orders accompanied by remittance.)

Name .....
Address .....
City and State .....
Position .....
Company .....S. Fac. 12-41
(Books sent on approval in U. S. and Canada only.)

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Save Shipping Room Dollars By Testing Your Packing Method

In developing a packing method for speed in the shipping room, safety in transit, and acceptable appearance, featuring of your name and advertising, many packers have found that a "ride test" of a sample number of packages enables them to pick the packaging method that saves most time and money.

A number of new packs are made up in the shipping room, and sent to a destination in the regular way. They are then checked for their *unit-time* and *convenience* in the shipping room, and their *freedom from container failure* in transit.

Testing in this way, a number of shippers have found that for their particular products stapling and stitching with modern Bostitch machines are faster, easier operations, providing more protection, and *better* appearance:

1. *In the shipping room.* Stapled containers save the drying time normally required for sealing . . . cartons are made up as needed . . . no expensive storage space required. Staples cannot cover the printed message and destroy its effectiveness.

2. *In transit.* Staples make strong closures, not affected by moisture. They reduce pilferage losses, and prevent the container failures which so often result in damage or customer ill-will. A better package, reaching your customer in better condition.

Even more significant are the tangible savings which many manufacturers have obtained through Bostitching. For instance:

Bostitch "Autoclench" Fastens 3 Times As Many Cartons Per Man-Hour

For a manufacturer of auto parts, the Bostitch Autoclench . . . a stapler which seals filled cartons from the outside without inserting a blade . . . was 3 times as fast as the method formerly employed and saved 12 cents per man-hour in cost of materials.

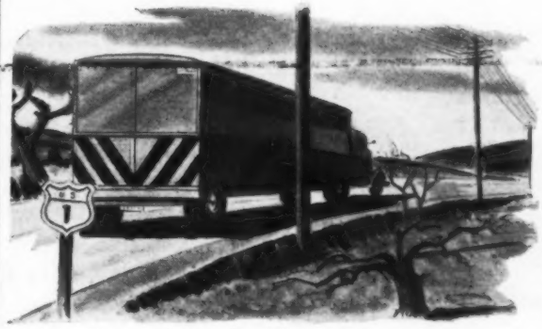
You also may save hundreds of dollars annually by testing your present packing method against the proven advantages of Bostitching. Make your plans today, in cooperation with a Bostitch trained representative, and cash in on your new Bostitch equipment tomorrow, as national needs permit. Write BOSTITCH, 60 Division Street, East Greenwich, R. I.

In the Shipping Room

Packing time and floor space are saved . . . waiting for adhesives to dry is eliminated altogether . . . by fastening with wire, using speedy, economical, easy-to-operate Bostitch Machines. Savings have often paid for new machines within a year!

BOSTITCH

SAVES YOU TIME AND MONEY ON BOTH SIDES OF THE SHIPPING PLATFORM



In Transit

Better Protection: Bostitch staples are *not loosened by dampness or refrigeration . . . pilferage is discouraged . . . tampering quickly detected . . . shocks cushioned by a more yielding type of fastening.* RESULT: product shipped more safely; delivered in better condition.

BOSTITCH BOTTOM STITCHER seals bottoms of fibre or corrugated containers. Makes its own staples from a coil of wire.

BOSTITCH AUTOCLENCH quickly seals filled cartons from the outside, without inserting a blade.

BOSTITCH HAMMER AND TACKER drives a staple with each blow. Saves time on many tagging and tacking jobs.

BOSTITCHING

is using the right machine and the exact size and kind of staple to get the most efficient fastening results. 18 research engineers and over 300 field representatives can help you. Write for "Bostitch in the Shipping Room" and ask about availability of staples for defense or non-defense purposes.

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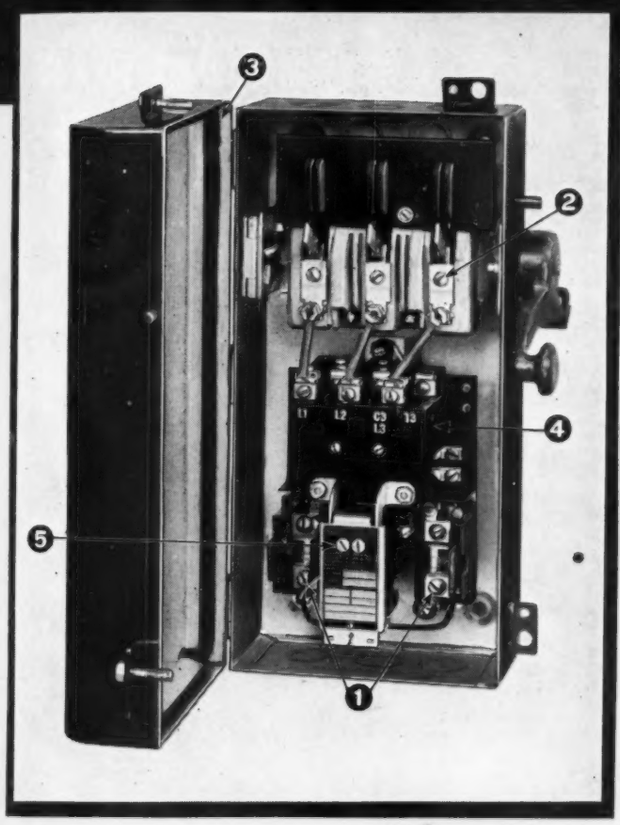

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● One of the largest automobile plants recently made comparative tests of all makes of magnetic starters. Size 1 combination starters with disconnect switch were used. The tests were made under the supervision of the chief electrician and his assistant. The Starters built by the seven leading manufacturers passed with varying degrees of merit.

The chief electrician, wisely, wanted the independent opinion of the men who actually install, use and repair the electrical equipment. Five of his best men, two from the construction and three from the maintenance department, were asked to examine and rate the seven starters on the basis of (1) overload relays (2) disconnect switch (3) cabinet construction (4) contact mechanism and rupturing capacity and (5) accessibility of parts. The best or equal starter for each feature was scored with 20 points; the others were penalized a relative number of points. The results (as shown in chart above) speak for themselves.

It's the electrician in the factory who knows how control apparatus performs year in and year out. It's his job to inspect it--replace parts when required—above all to avoid costly shut-downs. These plant electricians prefer Square D electrical equipment of all types and kinds.

1 Thermal overload relays of Melting Alloy type. Patented unit construction prevents faulty installation and permits factory test. Units are clearly marked and easily exchanged.

2 Motor circuit switch with quick make and break action, visible blades, line terminal guard and cover safety interlock.

3 Cabinet of heavy gauge sheet steel with felt cover gaskets (NEMA 1A), provisions for padlocking, rounded cover, and baked machine blue enamel finish with aluminum interior.

4 Contact mechanism has straight line, vertical action with double break silver contacts in an enclosed arc chamber to provide high rupturing capacity.

5 Accessibility of parts is accomplished without sacrifice in size. Removal of two screws permits armature assembly and yoke bar to be taken off, exposing all parts for inspection or normal maintenance.

SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

KOLLSMAN INSTRUMENT DIVISION, ELMHURST, NEW YORK

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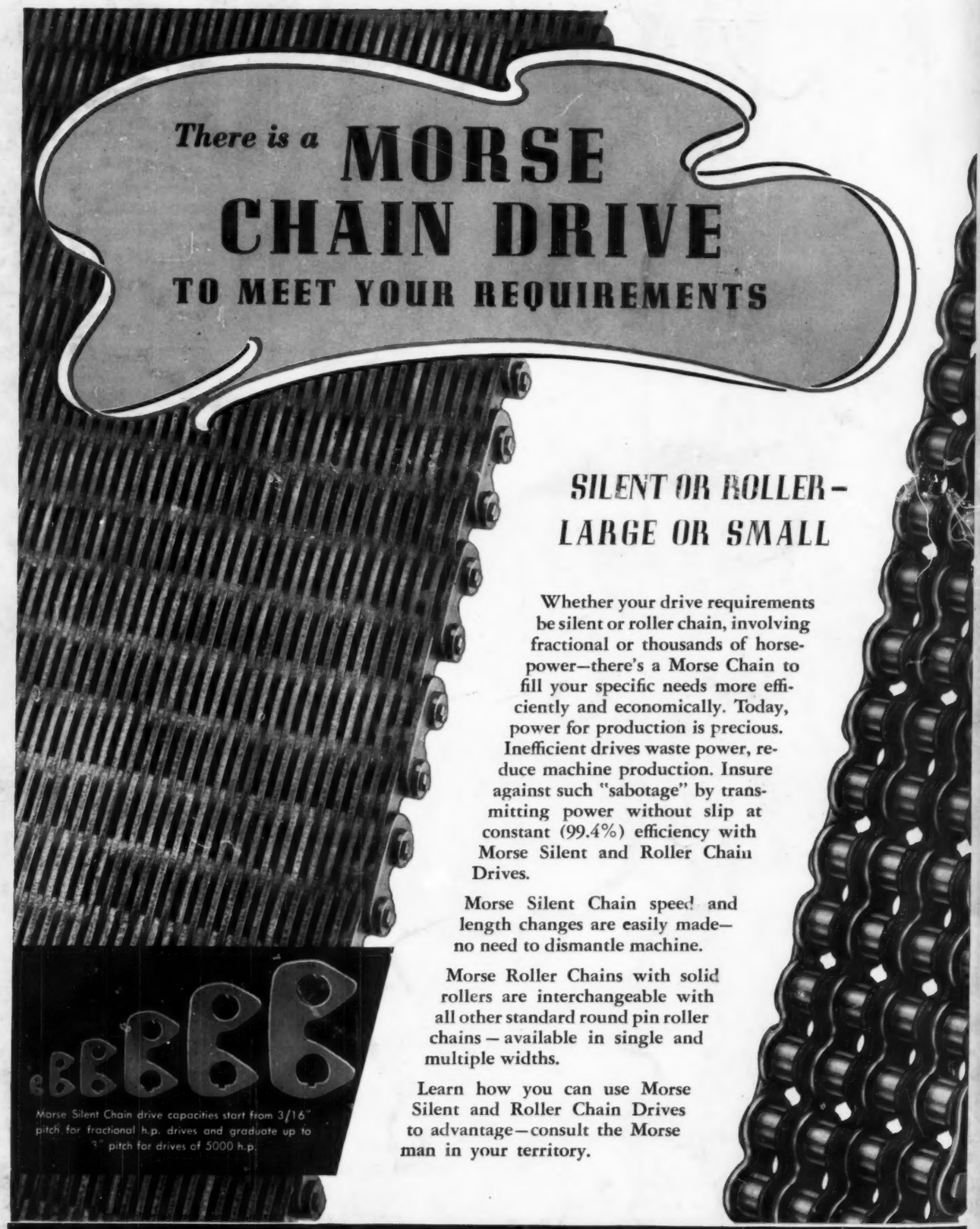

Morse Silent Chain drive capacities start from 3/16" pitch for fractional h.p. drives and graduate up to 3" pitch for drives of 5000 h.p.

SILENT OR ROLLER— LARGE OR SMALL

Whether your drive requirements be silent or roller chain, involving fractional or thousands of horsepower—there's a Morse Chain to fill your specific needs more efficiently and economically. Today, power for production is precious. Inefficient drives waste power, reduce machine production. Insure against such "sabotage" by transmitting power without slip at constant (99.4%) efficiency with Morse Silent and Roller Chain Drives.

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